Second Five-Year Review Report

for

Former Naval Construction Battalion Center Davisville
North Kingstown, Rhode Island

Naval Facilities Engineering Command
Mid-Atlantic

Contract Number N62467-04-D-0055
Contract Task Order 472

March 2008

TETRA TECH

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND - REGION I
1 CONGRESS STREET, SUITE 1100 (HBT)
BOSTON, MASSACHUSETTS 02114-2023

March 28, 2008

Curtis Frye
Dept of the Navy, BRAC PMO Northeast
Code 5090 BPMO NE/CF
4911 South Broad St
Philadelphia, PA 19112-1303

Re: *"Second Five-Year Review Report for Former Naval Construction Battalion Center, North Kingstown, Rhode Island"*, dated March 2008, at the former Davisville Naval Construction Battalion Center, North Kingstown, RI

Dear Mr. Frye:

This office is in receipt of the *"Second Five-Year Review Report for Former Naval Construction Battalion Center, North Kingstown, Rhode Island"*, dated March 2008. EPA reviewed the report for compliance with the Comprehensive Five-Year Review Guidance (OSWER No. 9355.7-03B-P dated June 2001). The report addresses nine operable units (OUs) at the Site and establishes protectiveness statements for two of those operable units, OU 1- Allen Harbor Landfill and OU 8- Calf Pasture Point. The protectiveness statements are required because those two remedies have hazardous substances, pollutants or contaminants remaining within the operable unit. Upon review of this report, EPA concurs at this time with the Protectiveness Statements for each of the two operable units. The protectiveness statements establish that the remedies are currently protective of human health and the environment. However, both protectiveness statements also make reference to additional work that is necessary to ensure long-term protectiveness of the remedies.

Land use controls, including shellfishing bans, played a key role in EPA's determination that both OU 1 and OU 8 are currently protective. The Navy must ensure that those institutional controls remain effective until such time that they are no longer necessary. In addition, consistent with the recommendations laid out in Five-Year Review for both sites, the Navy will need to revise its long-term monitoring plans to ensure that the extent of contamination in all media is adequately understood and that the remedies continue to meet the objectives of the Records of Decision. We look forward to subsequent team meetings at which we can discuss any additional work and strive to address Rhode Island Department of Environmental Management's comments and concerns.

The 2008 Five-Year Review, the second comprehensive Five-Year Review completed at the

Former Naval Construction Battalion Center, was triggered by the first comprehensive Five-Year Review completed in 2003. Consistent with Section 121(c) of CERCLA, the next Five-Year Review must be finalized on or before March 28, 20~~14~~. 2013

If you have any questions with regard to this letter, please contact Christine Williams at (617) 918-1384 or Bryan Olson at (617) 918-1365.

Sincerely,

for James T. Owens, Director
Office of Site Remediation and Restoration

cc: Christine Williams
Richard Gottlieb, RIDEM
Johnathan Reiner, ToNK
Steven King, QDC
Dave Barney, Navy BRAC PMO

SECOND FIVE-YEAR REVIEW REPORT

for

FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION - NAVY (CLEAN) CONTRACT

Prepared for:
Naval Facilities Engineering Command Mid-Atlantic
9742 Maryland Avenue
Norfolk, Virginia 23511-3095

Contract Number N62467-04-D-0055
Contract Task Order 472

March 2008

APPROVED BY:

DAVID A. BARNEY
BRAC ENVIRONMENTAL COORDINATOR
BRAC PMO NORTHEAST

28 MARCH 2008
DATE

W5207476F

SECOND FIVE-YEAR REVIEW REPORT

for

FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE NORTH KINGSTOWN, RHODE ISLAND

COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION - NAVY (CLEAN) CONTRACT

Submitted to:
Naval Facilities Engineering Command Mid-Atlantic
9742 Maryland Avenue
Norfolk, Virginia 23511-3095

Submitted by:
Tetra Tech NUS, Inc.
234 Mall Boulevard, Suite 260
King of Prussia, PA 19406

Contract Number N62467-04-D-0055
Contract Task Order 472

March 2008

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LIST OF ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
AWQC	Ambient Water Quality Criteria
BCT	BRAC Cleanup Team
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLTMP	Conceptual Long-Term Monitoring Plan
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CSFs	Cancer Slope Factors
CSM	Conceptual Site Model
CTO	Contract Task Order
CVOC	Chlorinated Volatile Organic Compound
DANC	Decontaminating Agent Non-Corrosive
DCE	Dichloroethene
DD	Decision Document
DDE	Dichlorodiphenyldichloroethylene
DNAPL	Dense Non-Aqueous Phase Liquid
ELUR	Environmental Land Use Restriction
EPA	Environmental Protection Agency
EPCs	Exposure Point Concentrations
ERA	Ecological Risk Assessment
ERM	Effects Range Median
ESD	Explanation of Significant Differences
FFA	Federal Facilities Agreement
FOST	Finding of Suitability to Transfer
FS	Feasibility Study
FWENC	Foster Wheeler Environmental Corporation
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IR	Installation Restoration
IRIS	Integrated Risk Information System
LTM	Long-Term Monitoring
LTMP	Long-Term Monitoring Program

LIST OF ACRONYMS (cont.)

LUCIP	Land Use Control Implementation Plan
MCL	Maximum Contaminant Level
ME	Monitoring Event
MSL	Mean Sea Level
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
NCBC	Naval Construction Battalion Center
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operations and Management
PAH	Polynuclear Aromatic Hydrocarbon
PAL	Project Action Limit
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PRG	Preliminary Remediation Goal
QAPP	Quality Assurance Project Plan
RAB	Restoration Advisory Board
RAGS	Risk Assessment Guidance for Superfund
RAO	Remedial Action Objective
RBCs	Risk-Based Concentrations
RCRA	Resource Conservation and Recovery Act
RfDs	Reference Doses
RG	Remedial Goal
RI	Remedial Investigation
RIDEM	Rhode Island Department of Environmental Management
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SARA	Superfund Amendment and Reauthorization Act
SDWA	Safe Drinking Water Act
SVOC	Semivolatile Organic Compound
TBCs	To Be Considered
TCE	Trichloroethene
TPH	Total Petroleum Hydrocarbons
UCL	Upper Concentration Limit
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The Installation Restoration Program for the former Naval Construction Battalion Center (NCBC) Davisville, located in North Kingstown, Rhode Island, includes 13 Sites and 3 Study Areas. Two of these Sites (Site 07 – Calf Pasture Point and Site 09 – Allen Harbor Landfill) are active sites in long-term monitoring for which the selected remedy includes hazardous substances, pollutants, or contaminants remaining above levels that allow for unlimited use and unrestricted exposure. As such, there is a statutory requirement under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to review these remedies at least once every five years to assure that they continue to be protective of human health and the environment. This is the second five-year review for the NCBC Davisville facility. The triggering action for this review is the completion of the first five-year review on 28 March 2003.

At Calf Pasture Point, the remedy includes institutional controls (deed restrictions) and long-term monitoring of groundwater and sediment. Deed restrictions include a prohibition on the construction of buildings for residential or commercial use; a prohibition on the construction of any building, structure, or facility without adequate ventilation as approved by the Navy, EPA, and RIDEM; and a prohibition on the installation of water supply wells and the use of groundwater for any purpose other than sampling or remediation. Compliance with deed restrictions is documented annually via the Land-Use Control Implementation Plan (LUCIP) for NCBC Davisville. As of this review, 8 rounds of long-term monitoring have been completed at Calf Pasture Point. Long-term monitoring data is used to evaluate the stability of the groundwater plume and verify the absence of unacceptable risks along the site shoreline.

Based on the data review and technical assessment performed for this five-year review, the remedy at Calf Pasture Point is currently protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being addressed through institutional controls that prevent exposure to contaminants in site groundwater. In order to ensure that the remedy continues to be protective in the long term, further investigation within the chlorinated volatile organic compound (CVOC) source area and along the shoreline is warranted. Additional investigations will include a source area investigation; the development of trigger values, based on the June 2007 risk assessment, for shoreline piezometers and sediment samples to determine whether concentrations reaching the shoreline pose unacceptable risks; and the development of a decision matrix to guide future actions should the trigger values be exceeded. Supplemental risk assessment and monitoring program optimization will continue to be utilized during the LTMP to verify the protectiveness of the remedy and to ensure that potential exposure pathways are being adequately monitored.

At Allen Harbor Landfill, the remedy includes a multimedia cap (including a passive gas venting system); stone shoreline revetment; an offshore breakwater structure; the construction of an inter-tidal wetland; institutional controls (deed restrictions); and long-term monitoring of groundwater, sediment, shellfish, and landfill gas. Deed restrictions include a land-use restriction limiting the site to park and recreational uses only; a prohibition on the installation of water supply wells and the use of groundwater for any purpose other than sampling or remediation; and restrictions on the types of activities permitted at the site, such as a prohibition on digging, use of motorized vehicles, or any other activity that may damage the remedy components or otherwise allow exposure to hazardous materials contained under the landfill cap. Compliance with deed restrictions is documented annually via the LUCIP. As of this review, 22 rounds of long-term monitoring have been completed at Allen Harbor Landfill. Long-term monitoring data is used to evaluate the stability of the groundwater plume and verify the absence of unacceptable risks at potential exposure points along the landfill shoreline.

Based on the data review and technical assessment performed for this five-year review, the remedy at Allen Harbor Landfill is currently protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being addressed through remedy-related institutional controls and a state-enforced prohibition on shellfishing in Allen Harbor. These controls are effectively preventing exposure to site-related contaminants. In order to verify that the remedy continues to be protective for the long-term, changes to the long term monitoring program are warranted. Re-evaluation and optimization of the current long-term monitoring program is included as one of the action items from this five-year review.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name: Former Naval Construction Battalion Center Davisville		
EPA ID: RI6170022036		
Region: 1	**State:** RI	**City/County:** Washington
SITE STATUS		
NPL status: Final		
Remediation status: Operating		
Multiple OUs? Yes	**Construction completion date:**	
Has site been put into reuse? Yes		
REVIEW STATUS		
Lead agency: U.S. Department of the Navy		
Author name: Prepared by Tetra Tech NUS under contract to the Navy		
Author title:	**Author affiliation:**	
EPA's Review period: March 2003 to December 2007		
Date(s) of site inspection: Various dates.		
Type of review: Post-SARA		
Review number: 2 (second)		
Triggering action: First Five-Year Review – March 28, 2003		
Triggering action date *(from WasteLAN)*: 03/27/2003		
Due date *(five years after triggering action date)*: 03/28/2008		

Five-Year Review Summary Form, cont'd.

Issues:

Calf Pasture Point:

1. The Long-Term Monitoring Program for Site 07 needs to be reviewed/updated. Plume expansion to the south and east suggests the plume may not be stable.
2. There is uncertainty regarding CVOC source area.
3. There was an increase in CVOC concentrations in entrance channel piezometers during 2004/05.
4. Increasing monitoring costs.
5. Risk communication to community. Several interviewees expressed concern over the risks associated with contamination at Calf Pasture Point.
6. The Environmental Land Use Restriction for Parcel 9 has yet to be recorded.

Allen Harbor Landfill:

1. The Long-Term Monitoring Program for Site 09 needs to be reviewed/updated.
2. Landfill maintenance activities have not been communicated effectively to the BCT. Semi-annual inspection reports, landfill survey reports, and other landfill maintenance documentation appear not to have been formally distributed to the BCT.
3. Risk communication to community.

Five-Year Review Summary Form, cont'd.

Recommendations and Follow-up Actions:

Calf Pasture Point:

1. a) Finalize *Revised CSM and Monitoring Optimization Report for Site 07.*
   b) Schedule a DQO meeting to discuss optimization of the LTMP and establish the objectives and scope of the LTMP.
   c) Prepare a revised Work Plan/SAP for Long-Term Monitoring at Site 07.

2. a) Schedule a DQO meeting to establish objectives and scope for source area investigation.
   b) Prepare a Work Plan/SAP to support the source area investigation.

3. a) At the DQO meeting for LTMP, establish the objectives and scope for future shoreline monitoring.
   b) Develop trigger values for shoreline media to verify that CVOCs reaching the shoreline continue to pose no unacceptable risks.
   c) Develop decision matrix to guide decision making for shoreline monitoring program.

4. a) Finalize *Revised CSM and Monitoring Optimization Report for Site 07.*
   b) At DQO meeting for LTMP, discuss optimization of LTMP.
   c) Based on results of source area investigation, consider source reduction technologies that might reduce long-term monitoring costs.

5. Develop fact sheet for Site 07 providing information to the public in laymen's terms regarding risks associated with planned activities and uses for Calf Pasture Point.

6. Work with the Town of North Kingstown to expedite recording of the ELUR for Parcel 9.

Allen Harbor Landfill:

1. a) Schedule a DQO meeting to discuss optimization of the LTMP and establish the objectives and scope of the LTMP.
   b) Prepare a revised Work Plan/SAP for Long-Term Monitoring at Site 09.

2. a) Include a section in quarterly monitoring reports or annual monitoring reports detailing landfill maintenance activities completed.
   b) Maintain a regular semi-annual inspection schedule and provide draft semi-annual landfill inspection reports to the BCT within one month of inspections.

3. Develop fact sheet for Site 09 providing information to the public in laymen's terms regarding risks associated with planned activities and uses for Allen Harbor Landfill.

Five-Year Review Summary Form, cont'd.

Protectiveness Statements:

Calf Pasture Point:

The remedy at Calf Pasture Point is currently protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being addressed through institutional controls that prevent exposure to contaminants in site groundwater. In order to ensure that the remedy continues to be protective in the long term, further investigation within the source area and along the shoreline is warranted. Additional investigations will include a source area investigation; the development of trigger values, based on the June 2007 risk assessment, for shoreline piezometers and sediment samples to determine whether concentrations reaching the shoreline pose unacceptable risks; and the development of a decision matrix to guide future actions should the trigger values be exceeded. The objectives and scope of these investigations will be developed through the Data Quality Objectives (DQO) process as described in the *Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP)* Guidance.

Allen Harbor Landfill:

The remedy at Allen Harbor Landfill is currently protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being addressed through remedy-related institutional controls and a state-enforced prohibition on shellfishing in Allen Harbor. These controls are effectively preventing exposure to site-related contaminants.

In order to verify that the remedy continues to be protective for the long-term, changes to the long term monitoring program are warranted. The objectives and scope of these changes will be developed through the DQO process as described in the *Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP)* Guidance.

1

1.0 INTRODUCTION

Under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract No. N62467-04-D-0055, Contract Task Order (CTO) No. 472, Tetra Tech NUS, Inc. (Tetra Tech) was contracted to prepare the second Five-Year Review Report for the Former Naval Construction Battalion Center (NCBC) Davisville in North Kingstown, Rhode Island.

1.1 OVERVIEW OF THE FIVE-YEAR REVIEW PROCESS

The purpose of the five-year review is to determine whether the remedy at a site (or sites) is protective of human health and the environment. The methods, findings, and conclusions of the five-year review for the former NCBC Davisville are documented in this Five-Year Review Report. In addition, this report presents issues identified during the review and provides recommendations to address them.

The following is a summary of the requirements for five-year reviews:

- The statutory requirement for five-year review was added to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as part of the Superfund Amendments and Reauthorization Act of 1986 (SARA). A five-year review is required when both of the following conditions are met, whether the site is on the National Priorities List (NPL) or not:

    1) Upon completion of the remedial actions at a site, hazardous substances, pollutants, or contaminants remain above levels that allow for unlimited use and unrestricted exposure. For example, if a site is restricted to industrial use because hazardous substances, pollutants, or contaminants remain above levels that allow for unlimited use and unrestricted exposure, five-year reviews must be conducted.

    2) The Record of Decision (ROD) or Decision Document (DD) for the site was signed on or after October 17, 1986 (the effective date of SARA).

- CERCLA §121(c), as amended, states:

    If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in *accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

- The National Contingency Plan (NCP), 40 C.F.R. Part 300.430(f)(4)(ii), states:

  If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited, and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.

This is the second five-year review for the former NCBC Davisville. The triggering action for this statutory review is the completion of the first five-year review in 2003.

This Five-Year Review Report has been prepared in accordance with the U.S. Environmental Protection Agency (EPA) *Comprehensive Five-Year Review Guidance*, dated June 2001 (EPA 540-R-01-007, OSWER No. 9355.7-03B-P), and the U.S. Department of the Navy *Policy for Conducting Five-Year Reviews Under the CERCLA Program* (Navy, 2004).

1.1.1 Public Notification

To initiate the five-year review for NCBC Davisville, Navy developed a press release and provided it to two local newspapers to notify the public of the review. The press release ran in the 6 September 2007 edition of the *North Kingstown Standard Times* and the 7 September 2007 edition of the *Providence Journal*. The release announced the commencement of the review process, provided a brief description of the five-year review process, and invited the public to provide input on the remedies at Calf Pasture Point and Allen Harbor Landfill.

The Navy gave a presentation at the 20 September 2007 Restoration Advisory Board (RAB) meeting providing further information on the five-year review process and sharing the schedule for the review. The slides from this presentation are included in Appendix A.

During the September 2007 RAB meeting a questionnaire was distributed to solicit input from the community on the remedial activities at Calf Pasture Point and Allen Harbor Landfill. The questionnaire was also distributed through the mail to approximately 125 RAB members with the notes from the 20 September 2007 RAB meeting. The Navy received two responses to this questionnaire. These responses are provided in Appendix A.

1.1.2 Interviews

The following individuals were interviewed as part of the second five-year review for NCBC Davisville:

Interviewee	Title/Affiliation
Jonathan Reiner	North Kingstown Planning and Development Director
Philip Bergeron	North Kingstown Department of Public Works Director
Fred Santos	ECC Field Operations Leader (Navy LTM Contractor)
Steven King	Quonset Development Corporation Chief Operating Officer
Elyse LaForest	National Park Service
Jay O'Brien	RAB Member/North Kingstown Resident
Lorena Pugh	RAB Member/North Kingstown Resident

The types of questions that were asked of interviewees are provided on the RAB Questionnaire (Appendix A). Also in Appendix A is a summary of information gathered during these interviews.

1.2 ROLES AND RESPONSIBILITIES

Tetra Tech was contracted by the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic to perform the five-year review and prepare this Five-Year Review Report with their review and input. The review team for this document includes EPA and the Rhode Island Department of Environmental Management (RIDEM).

1.3 SCOPE OF THE FIVE-YEAR REVIEW

This second five-year review addresses Navy Installation Restoration (IR) Site 07 (EPA Operable Unit [OU] 8), Calf Pasture Point and Navy IR Site 09 (EPA OU1), Allen Harbor Landfill; the two sites at NCBC Davisville that meet the criteria discussed in Section 1.1.

1.4 STATUS OF OTHER CERCLA SITES AT NCBC DAVISVILLE

Table 1-1 provides a summary of the status of other CERCLA sites at NCBC Davisville.

1.5 NEXT REVIEW

The next five-year review for the former NCBC Davisville is required by March 2013, five years from the date of this review.

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2.0 SITE 07 – CALF PASTURE POINT

This section presents the findings of the five-year review for the remedy that was implemented at Navy IR Site 07 (Calf Pasture Point) at the former NCBC Davisville. The format of this section follows that which is presented in the EPA *Comprehensive Five-Year Review Guidance* (June 2001).

2.1 CALF PASTURE POINT SITE CHRONOLOGY

Event	Date
Sometime during this time period, a trench was reportedly filled with containers that contained Decontaminating Agent Non-Corrosive (DANC) solution (1,1,2,2-tetra-chloroethane [1,1,2,2-PCA] and oxidizing agents that readily break down to release chlorine when contacted by water, which can be used as a disinfectant).	1968-1974
Completion of the Initial Site Assessment of the former NCBC Davisville facility (Hart, 1984).	9/1984
Completion of the Verification Step – Confirmation Study of the former NCBC Davisville facility (TRC, 1987).	2/1987
EPA's Hazard Ranking Scoring Package for the former NCBC Davisville facility.	1989
NCBC Davisville facility placed on the CERCLA NPL.	11/21/1989
FFA signed by the Navy, EPA, and the State of Rhode Island.	3/1992
Munitions bunker Building 339 demolished by the Navy (FWENC, 1997).	2/1997
Remedial Investigation completed (EA, 1998a).	9/11/1998
Record of Decision (ROD) signed.	9/30/1999
Class I survey of Parcel 9 completed and annotated with references to the deed for ground-water use and land-use restrictions.	2/2000
Final Conceptual Long-Term Monitoring (LTM) Plan (CLTMP) which included establishment of the performance standards (New Fields, 2000a).	3/7/2000
Finding of Suitability to Transfer (FOST) to transfer the property (Parcel 9) to the U.S. Department of Interior for transfer to the Town of North Kingstown, Rhode Island (Navy, 2000). The FOST includes the Environmental Land-Use Restrictions (ELUR) required by the ROD and deed covenants. Effective date of Memorandum of Agreement (MOA) between Navy, EPA, and Town of North Kingstown	5/2000
Munitions bunker Buildings 59 and 60 demolished by the Navy (FWENC, 2000a).	9/2000
Final Quality Assurance Project Plan (QAPP) for LTM of Site 07.	7/2001
LTM plan initiated with Monitoring Event (ME) 01: 16 wells and 10 piezometers.	8/2001
Parcel 9 received by the Town of North Kingstown and the deed recorded.	10/2001
Final Land-Use Control Implementation Plan (LUCIP) that includes the inspection procedures for Site 07 to document compliance with the land-use controls and/or deed covenants placed by the Navy on this transferred Navy property (Parcel 9).	1/2002
Final LUCIP Annual Letter Report documenting compliance with land-use controls for Parcel 9 (Calf Pasture Point) during 2001.	2/14/2002
Site 07 Remedy Design Hydrogeologic Investigation Report (EA, 2002a).	5/2002
Revision 01 to the Final QAPP for Long-Term Monitoring of Site 07 to add 14 piezometer sampling locations (P07-11 through P07-24) along the Allen Harbor shoreline and to add salinity to the analytical program for the piezometer samples.	5/2002
ME 02 sampling: 26 wells (9-month and 27-month list) and 24 piezometers.	5/2002
Shallow wells MW07-35S and MW07-36S installed along the Allen Harbor shoreline for the Long-Term Monitoring Plan (LTMP).	10/2002

Event	Date
EPA Conceptual Site Model (CSM) Presentation for Site 07 – December 2002 BCT meeting.	12/2002
Nine piezometer locations (P07-25 through P07-33) added to LTMP as recommended in the Five-Year Review Report.	2/2003
ME 03 sampling: 18 wells (9-month list) and 33 piezometers.	2/2003 - 3/2003
Signature date of the *First Five-Year Review Report* for NCBC Davisville.	3/28/2003
ME 04 sampling: 18 wells (9-month list) and 33 piezometers.	12/2003 - 1/2004
Final LUCIP Annual Letter Report documenting compliance with land-use controls for Parcel 9 (Calf Pasture Point) during 2003 (EA, 2004e).	2/11/2004
Nine monitoring wells installed at Site 07 (MW07-27S, MW07-35D, MW07-37S/D, MW07-38S/D, and MW07-39S/I/D) as recommended in the *First Five-Year Review Report* (EA, 2003c).	3/2004 - 4/2004
Navy collects pore water and surface water samples from P07-06 through P07-10 locations for VOC analysis.	5/2004
Navy submits draft *Revised Conceptual Site Model and Monitoring Optimization Report for Site 07, Calf Pasture Point* (Battelle, 2004).	8/4/2004
ME 05 sampling: 37 wells (9-month and 27-month list) and 33 piezometers	8/2004
Final *Project Plan for Coastal Contamination Migration Monitoring Assessment* (SPAWAR, 2004) submitted by Navy to describe investigation to collect samples from off-shore areas in order to delineate CVOC plume discharge areas.	10/2004
Navy initiates bi-monthly piezometer sampling in entrance channel (P07-04, 05, 06, 07, 08, 09, 10, and 24), with collocated surface water samples, in response to elevated detections of CVOCs in piezometers.	10/2004
EPA conducts plume discharge investigation along Calf Pasture Point shoreline.	10/2004 - 11/2004
Second bi-monthly entrance channel piezometer/surface water sampling event.	12/2004
Third bi-monthly entrance channel piezometer/surface water sampling event.	1/2005
EPA submits draft *Plume Discharge Investigation* report.	1/2005
Navy submits draft *Coastal Contaminant Migration Monitoring Assessment for Site 7* (SPAWAR, 2005), summarizing results of off-shore investigations.	2/9/2005
Fourth bi-monthly entrance channel piezometer/surface water sampling event.	3/2005
Fifth bi-monthly entrance channel piezometer/surface water sampling event.	4/2005
EPA CSM Evaluation included in comment letter for ME 05.	4/27/2005
ME 06 sampling: 27 wells (9-month list) and 33 piezometers.	5/2005
Sixth bi-monthly entrance channel piezometer/surface water sampling event.	7/2005
Seventh bi-monthly entrance channel piezometer/surface water sampling event.	9/2005
Eighth bi-monthly entrance channel piezometer/surface water sampling event.	11/2005
Ninth bi-monthly entrance channel piezometer/surface water sampling event.	1/2006
Final LUCIP Annual Letter Report documenting compliance with land-use controls for Parcel 9 (Calf Pasture Point) during 2004 (TtNUS, 2006b).	6/12/2006
Final LUCIP Annual Letter Report documenting compliance with land-use controls for Parcel 9 (Calf Pasture Point) during 2005 (TtNUS, 2006c).	8/15/2006
ME 07 sampling: 27 wells (9-month list) and 33 piezometers	11/2006
Navy submits final *Sampling Recommendations to Minimize Impacts to Wetlands at Site 7 (Calf Pasture Point)* (Battelle, 2007).	2/5/2007
ME 08 sampling: 46 wells (9-month, 27-month, and contingency wells) and 33 piezometers	3/2007
Final LUCIP Annual Letter Report documenting compliance with land-use controls for Parcel 9 (Calf Pasture Point) during 2006 (TtNUS, 2007h).	5/21/2007
Navy submits final *Human Health Risk Assessment of Shoreline Surface Waters and Sediments, and Groundwater in Shallow Piezometers* (TtNUS, 2007l) for Calf Pasture Point, using bi-monthly piezometer/surface water data, and other LTMP data, to determine that there are no unacceptable risks to swimmers/waders associated with CVOC discharges to the shoreline environment at Site 07.	6/2007
Navy submits *Revised CSM and Monitoring Optimization Report for Site 07* (Battelle, 2008)	1/2008

2.2 CALF PASTURE POINT BACKGROUND INFORMATION

In this section, background information for Calf Pasture Point such as physical characteristics, current and former land use, and a history of environmental actions is presented.

2.2.1 Physical Characteristics

Calf Pasture Point is a peninsula located on the northeast portion of the Former NCBC Davisville facility (Figure 2-1). Site 07 is located in the southern portion of Calf Pasture Point (Parcel 9) on the northeastern edge of Allen Harbor (Figure 2-2). Narragansett Bay, the harbor entrance, and the harbor itself form the eastern, southern, and southwestern shorelines of Site 07, respectively.

Calf Pasture Point formerly contained three munitions bunkers (Buildings 59, 60, and 339) located along Magazine Road, which formerly traversed the site from north to south between Sanford Road/Finn Street and the southern tip of Calf Pasture Point. The bunkers were earthen-covered and were located in the middle of Calf Pasture Point to the north, east, and south of a bedrock outcrop. This outcrop is a prominent hill with a maximum elevation of approximately 55 feet above mean sea level (MSL), located north of well MW07-07S (Figure 2-2). The bunkers were demolished by the Navy in February 1997 (Building 339) and September 2000 (Buildings 59 and 60). IR Site 07 is comprised of the forest and grass covered area of Calf Pasture Point south of the former munitions bunkers (i.e., south of the bedrock outcrop) to the Allen Harbor and Narragansett Bay shorelines.

2.2.2 Land and Resource Use

From the early 1940s until the mid 1970s, Site 07 was used for the training of Naval Seabees (construction battalions) in the use of heavy construction. Additionally, a portion of the site was reportedly used for the disposal of cans of DANC solution.

Currently, the site is undeveloped property with forest and grass cover. Site 07 will not be used for residential purposes in the future because Calf Pasture Point has been transferred to the Town of North Kingstown as a Public Benefit Conveyance for use as an open space/conservation area. Acquisition in this manner restricts the transferee to use the property for the purpose of a park and recreation, in perpetuity, with no opportunity for residential or commercial development. Additionally, land-use restrictions, with compliance monitoring, have been placed on the land to ensure the property is not used in a manner that conflicts with the remedy.

Groundwater underlying Calf Pasture Point has been classified by RIDEM as GA (i.e., presumed to be suitable for public or private drinking water use without treatment). Allen Harbor is used for recreational boating and contains two marinas. In 1984, RIDEM closed much of Allen Harbor to shellfishing due to suspected contamination from several sources in and surrounding Allen Harbor. In 2004, the remainder of the Harbor (the entrance channel) was closed to shellfishing. No groundwater production wells are located on, or downgradient of, Site 07.

Allen Harbor is classified by RIDEM as SA {b} (i.e., class SA waters are designated for shellfish harvesting, contact recreational activities, and fish and wildlife habitat; the {b} designation indicates a "partial uses" status [that can affect the application of criteria] for waters in the vicinity of marinas and/or mooring fields where seasonal shellfishing closures are likely).

In accordance with the ROD (EA, 1999b) and as outlined in the Land-Use Control Implementation Plan (LUCIP) (EA, 2002b), Parcel 9 includes the following environmental land-use restrictions. These environmental land-use restrictions apply to the use of the contaminated site by the Grantee, its successors, and assigns, as delineated on Figure 2-3 (land-use restriction boundary).

- For the entire parcel, no construction of buildings for residential or commercial use.

- No construction or development of any building, structure, facility, or other improvement without adequate ventilation as approved by the Navy, EPA, and RIDEM within the portion of land south of the east-west line shown on Figure 2-3. This restriction will be required for as long as site conditions may pose an unacceptable risk to human health and the environment.

- For the entire parcel, water supply wells shall not be installed, nor shall groundwater be utilized except for sampling or other remedial purposes.

LUCIP inspections of Parcel 9 are performed in conjunction with each Site 07 LTMP monitoring event, but no less frequently than annually, to document that there has been no variance from the environmental land-use restrictions stated above and that there has been no interference with the implemented remedy.

The purpose of the environmental land-use restriction is to ensure:

- That the entire parcel shall be used for only park and recreational uses, not for residential or commercial use, as stated in the ROD.

- That no building, structure, facility or other improvement will be constructed without adequate ventilation in areas of the contaminated Site (Site 07), where a risk exists from contaminated groundwater.

- That groundwater for the entire parcel shall not be withdrawn or utilized except for sampling or other remedial purposes.

- That the contaminated site as delineated on Figure 2-3 ('land-use restriction boundary') is used by the Grantee, its successors, and assigns, in accordance with the above restrictions.

2.2.3 History of Contamination

Some time between 1968 and 1974 in the area south of the former munitions bunkers, a trench was reportedly filled with cans that contained DANC solution. The DANC solution disposed of in the trench is believed to be the source of a dissolved chlorinated volatile organic compound (CVOC) plume that is present in groundwater beneath Site 07. The approximate location of the disposal area has been inferred through various phases of investigation of this site to be within an area bounded by MW07-14, MW07-04, and MW07-05.

DANC is a reactive, chlorinated compound consisting of two separate chemicals that were mixed to form a decontaminating solution: 1,3-Dichloro-5,5-dimethyl-hydantoin, a white crystalline solid with a chlorine-like odor, and acetylene tetrachloride (1,1,2,2-tetrachloroethane [1,1,2,2-PCA]), a heavy colorless liquid. 1,3-Dichloro-5,5-dimethyl-hydantoin and hydantoin products are oxidizing agents and readily break down to release chlorine when contacted by water. 1,3-Dichloro-5,5-dimethyl-hydantoin, on contact with water, will liberate hypochlorous acid, a weak acid and strong oxidizing agent. In general, it can be used as a chlorinating agent, disinfectant, or industrial deodorant. In water treatment, it has been used as the active ingredient in powdered laundry bleach such as Sage's Dry Bleach and Colgate's Pruf (EA, 2004h).

2.2.4 Initial Response

The only pre-ROD cleanup activity performed at Calf Pasture Point was the demolition of one of the munitions bunkers in 1997. The other two bunkers were demolished in 2000.

2.2.5 Basis for Taking Action

Potential human health risks associated with exposure to the contaminants of concern (COCs) were estimated through the evaluation of several potential exposure scenarios. These scenarios were developed to reflect the potential for exposure to COCs based on the present land uses, the potential future land uses, and the location of the site. The Human Health Risk Assessment (HHRA) was prepared in accordance with CERCLA guidance using the Phase I, II, and III Remedial Investigation (RI) data (TRC 1991 and 1994; EA 1998a).

The Base Re-use Plan for Calf Pasture Point specifies open space/conservation, which may include recreational activities. Accordingly, the Navy evaluated exposure pathways for hypothetical future recreational users and consumers of locally-caught, non-depurated shellfish. For purposes of completeness the Navy also evaluated future construction/remediation workers and hypothetical future residents. The future recreational scenario assumed a showering facility may be constructed utilizing groundwater from the site; however, it is more likely that any future showering facility at Calf Pasture Point would use municipal water available in the area from the Town of North Kingstown. The following exposure pathways were considered to represent potentially completed pathways for potential receptor exposure to COCs in soil, groundwater, air, offshore sediment, shellfish, and/or surface water, and were evaluated in the HHRA for Site 07:

Exposures via Soil

- Incidental ingestion of total soil (by future construction workers)
- Incidental ingestion of surface soil (by recreational users)

Exposures via Sediment

- Incidental ingestion of sediment (by recreational users)

Exposures via Groundwater

- Incidental ingestion of shallow groundwater (by future construction workers)
- Consumption of deep/bedrock groundwater (by hypothetical future residents)
- Inhalation of volatile organic compounds (VOCs) from deep/bedrock groundwater while showering (by recreational users)
- Dermal contact with deep/bedrock groundwater while showering (by recreational users)

Exposures via Surface Water

- Incidental ingestion of surface water while swimming (by recreational child/adult users)
- Dermal contact with surface water while swimming (by recreational child/adult users)

Exposure via Shellfish

- Ingestion of shellfish collected from Allen Harbor adjacent to Site 07.

A detailed description of these exposure scenarios and pathways can be found in Section 6.4 of Volume I of the Phase III RI (EA, 1998).

CVOCs were identified as the primary COCs for Site 07, predominantly as 1,1,2,2-PCA and TCE in groundwater. Risk estimates for the following COCs exceeded a Hazard Index (HI) of 1 (i.e., an indication of the potential for adverse non-carcinogenic health effects) or the EPA target cancer risk range (10^{-4} to 10^{-6}):

Aluminum	Chloroform	1,1,2-trichloroethane (1,1,2-TCA)
Arsenic	Benzene	Trichloroethene (TCE)
Beryllium	Vinyl chloride	1,1,2,2-tetrachloroethane
Chromium	1,1-Dichloroethene (1,1-DCE)	Tetrachloroethene (PCE)
Manganese	1,2-DCE (total)	

Risk estimates for the following human exposure pathways were identified as unacceptable based on the risk assessment of COCs in the environmental media at Site 07:

- Ingestion of deep and bedrock groundwater by residential populations (due to elevated concentrations of VOCs and several inorganics)

- Inhalation of VOCs from deep and bedrock groundwater by recreational populations while showering

- Dermal contact with VOCs in deep and bedrock groundwater by recreational populations while showering.

The HHRA also evaluated risks assuming human exposure to COCs in shoreline and offshore sediment and shellfish. The marine Ecological Risk Assessment (ERA) (SAIC, 1996) evaluated risks to the environment using data for offshore sediment and shellfish samples collected along the western and southern shorelines of Calf Pasture Point. VOCs (the COCs at Site 07) were not identified as a concern in either the shoreline sediment or shellfish samples. No significant terrestrial ecological risks were identified at Site 07.

2.3 REMEDIAL ACTIONS

This section discusses the remedy selection and implementation history for Calf Pasture Point, along with a discussion of the long-term monitoring program currently in place at Site 07.

2.3.1 Remedy Selection

The ROD for Site 07 was signed on 30 September 1999. The selected remedy was deed restrictions with long-term monitoring (LTM). As stated in the ROD, the Remedial Action Objectives (RAOs) for Site 07 are to prevent human exposure to COCs in deep and bedrock groundwater and to ensure that the discharge of groundwater to wetlands and offshore areas continues to pose no unacceptable risks from COCs. The selected remedial alternative includes the following components:

- A deed restriction prohibiting the use of groundwater in order to prevent human contact with, or use of, impacted groundwater from the site (e.g., for drinking or showering purposes) maintained for as long as the site groundwater conditions may pose an unacceptable risk to human health or the environment. No groundwater use for any purpose (including showering, drinking, and irrigation) will be available onsite. In addition, any construction or development of any building, structure, facility, or other improvement within the southern portion of the property (Figure 2-3) shall be designed and constructed to include adequate ventilation as approved by the Navy, EPA, and RIDEM. The Grantee under the deed shall be required to submit a yearly certification to the Navy, EPA, and RIDEM of compliance with the deed restrictions. The groundwater and land-use restrictions contained in the deed shall be incorporated into an ELUR, which also shall be filed and recorded by the Navy or disposal agency in the land records of the Town of North Kingstown, Rhode Island, in accordance with state and local law.

- Long term monitoring of the groundwater plume to ensure that the site continues to pose no unacceptable risks to human health and the environment. Other media such as sediment from the shoreline or interior wetlands are also sampled, based upon trends identified from groundwater data.

- Five-year reviews of the remedy for the site by the Navy, EPA, and RIDEM to ensure the continued protection of human health and the environment (EA, 1999b).

Additionally, the ROD stated that signature of the ROD constituted final documentation that the three former munitions bunkers were closed appropriately as described in the Foster Wheeler Environmental Corporation (FWENC) Close-out Report (FWENC, 1997).

2.3.2 Remedy Implementation

During August 2001, the LTMP was initiated with ME 01. LUCIP inspections were initiated on 23 May 2001. The deed, without the ELUR, was recorded on 17 October 2001. Implementation of the LTMP began in 2001.

2.3.2.1 Long-Term Monitoring Sampling Events

LTM at Calf Pasture Point commenced during August of 2001 (ME 01). The schedule for LTM provided in the conceptual long-term monitoring plan for Calf Pasture Point specified sampling at nine-month intervals from a baseline number of sampling locations. An expanded list of sampling locations was planned at 27-month intervals (ME 02, 05, and 08). To date, eight sampling events have been completed. Additional sampling points have been added to the LTMP in response to sampling results:

Monitoring Event	Date	Wells Sampled	Piezometers Sampled
ME 01	August 2001	16	10
ME 02	May 2002	26	24
ME 03	February 2003	18	33
ME 04	December 2003	18	33
ME 05	August 2004	37	33
ME 06	May 2005	27	33
ME 07	November 2006	27	33
ME 08	February/March 2007	46	32

During the first monitoring event in 2001, the LTMP sampling network consisted of 16 on-site monitoring wells and 10 shoreline piezometers. All ten of the ME 01 piezometers were located along the southern shoreline of Calf Pasture Point within the entrance channel to Allen Harbor. For ME 02, an expanded (27-month) list of wells was sampled and 14 new piezometers were installed to monitor the western shoreline of Calf Pasture Point.

Based on the results of ME 01 and ME 02 sampling, and as recommended in the first *Five-Year Review Report for Former NCBC Davisville* (EA, 2003c), nine additional piezometers were installed and sampled during ME 03. The new piezometers were installed along the western shoreline of Calf Pasture Point between the two clusters of piezometers that were installed prior to ME 02, so that complete coverage of the plume discharge area in Allen Harbor was achieved. Also added to the LTMP network for ME 03 were monitoring wells MW07-35S and MW07-36S, which were installed in October 2002 to further characterize the extent of the CVOC plume in the shallow groundwater zone along the western edge of the site in the "cove" area south of well cluster MW07-33.

During March and April 2004, monitoring wells MW07-27S, MW07-35D, MW07-37S/D, MW07-38S/D, and MW07-39S/D were installed at Site 07, as recommended in the first *Five-Year Review Report for Former NCBC Davisville* (EA, 2003c). In addition, MW07-39I was added based on field screening information obtained during the drilling of MW07-39D. These nine monitoring wells were added to expand the LTM network for groundwater and to allow further evaluation of the site hydrogeology in the area southwest from the source area to the harbor "cove" area and the CVOC plume migration in the central portion of the site. These wells have been sampled during each LTMP round since ME 05 (August 2004).

2.3.2.2 Bi-Monthly Piezometer and Surface Water Sampling

In May 2004, in response to the detection of elevated concentrations of CVOCs in shoreline piezometers during the December 2003 sampling round, "No Swimming – No Wading" signs were erected along the shoreline in the entrance channel. After similar magnitude detections during the August 2004 sampling event, in October 2004 the Navy commenced supplementary bi-monthly sampling of shallow groundwater from piezometers P07-04, 05, 06, 07, 08, 09, 10, and 24 and surface water adjacent to these piezometers. These samples were analyzed for the same list of targeted VOCs specified for groundwater samples collected from Site 07. Bi-Monthly piezometer and surface water sampling continued until January 2006.

2.3.2.3 Shoreline Human Health Risk Assessment

In June 2007, the Navy completed a human health risk assessment using the shoreline surface water, sediment, and piezometer groundwater data collected during the LTMP (through ME 06) and the bi-monthly piezometer and surface water sampling program. The objective of the risk assessment was to evaluate human health risks associated with potential human exposure to surface waters, sediment, shallow groundwater, and shellfish located along the shoreline of Calf Pasture Point.

The risk assessment evaluated the following potential exposure pathways:

- Dermal contact (skin surface exposure) with or incidental ingestion of surface waters and sediments while swimming, wading, or gathering shellfish;
- Dermal contact with shallow groundwater while digging into shoreline sediments to gather shellfish; and
- Consumption of shellfish collected from along the Calf Pasture Point shoreline.

Standard EPA methodology, as presented in the EPA's *Risk Assessment Guidance for Superfund (Part A)* (December 1989) was used to estimate cancer and non-cancer risks associated with these potential exposure pathways.

Quantitative risk estimates for the receptors evaluated, and a listing of the primary chemicals of concern (COCs), are provided on Tables G-1 and G-2 of Appendix G, respectively. All of the cancer risk estimates developed for potential human exposure to chemicals of potential concern in surface water, sediment, and shallow groundwater while swimming, wading, or shellfishing were within the EPA's generally acceptable risk range and below RIDEM's cancer risk benchmarks. All of the non-cancer risk estimates associated with these exposures were below EPA and RIDEM risk benchmarks (TtNUS, 2007l). It should be noted that the 2007 shoreline risk assessment for Site 07 was based on data available at the time the assessment was prepared: the assessment was not based on modeled, future concentrations for environmental media along the shoreline.

The cancer and non-cancer risk estimates developed for the consumption of shellfish exceeded both EPA and RIDEM risk management benchmarks. The primary chemicals of potential concern contributing to the cancer and non-cancer risk estimates are arsenic, mercury, and PCBs. A review of source area data for Calf Pasture Point and background data for sediments and shellfish indicates that these chemicals are not present in shellfish as a consequence of disposal activities at Site 07 (TtNUS, 2007l).

2.3.2.4 Changes to Monitoring Frequency

Starting in the Fall of 2007, the Navy increased the frequency of long-term monitoring at Calf Pasture Point to semi-annual and temporarily added 9 monitoring wells to the LTMP network. These changes were made in order to augment the database of groundwater chemistry information, refine the conceptual site model, and optimize the monitoring program. Semi-annual monitoring will be conducted for the full 27-month well list plus six "contingent" wells and three additional wells not originally included in the LTM well list, for a total of 46 monitoring wells. Each round of monitoring will also include the collection of shallow groundwater samples from 33 piezometers and the collection of 6 sediment samples from along the entrance channel shoreline. The rationale for the inclusion of each of the 9 monitoring wells is provided below:

- MW07-05S: Provide an updated measure of VOCs present in the shallow aquifer within the presumed source area.
- MW07-05D: Additional characterization of VOC levels in the deep aquifer within the source area.
- MW07-16D: Assist in delineating the extent of contamination to the southeast.

- MW07-18D: Assist in delineating the extent of contamination to the southeast.
- MW07-20S: Assist in delineating contamination in the shallow aquifer to the southeast of the suspected source area.
- MW07-20D: Assist in delineating the extent of contamination to the southeast.
- MW07-23S: Located south of the source area near the entrance channel and to the west of MW07-21S. Analytical data from this well could verify whether upwelling has occurred in this downgradient area.
- MW07-24D: Assist in delineating the extent of contamination to the south/southeast of the suspected source area.
- MW07-29D: Assist in delineating the extent of contamination to the east of the source area.

The scope of future monitoring at Site 07 will be addressed as an action item for this Five-Year Review.

2.4 PROGRESS SINCE THE LAST REVIEW

The first five-year review concluded that a protectiveness statement could not be made at the time until further information was collected. The rationale for this conclusion was that the long-term monitoring plan stated that "8 rounds of sampling will be completed prior to determining the protectiveness of the remedy." As of the first five-year review for the site, only two rounds of monitoring had been completed.

The first five-year review did state that the remedy was "expected to be protective of human health and the environment as long as the institutional controls remain in place as implemented through the LUCIP". The report further elaborated that "in the interim, the exposure pathways that could result in unacceptable risk are being monitored," and noted that additional studies and/or other evaluations of the shoreline environment were being considered (see Section 2.5.2 – Data Review).

This section presents the recommendations and follow-up actions that were included in the first five-year review, with a brief description of the actions taken by the Navy since the last review.

2.4.1 <u>Issue 1: Additional Monitoring Data Needed to Refine Conceptual Site Model</u>

To address the issue of collecting additional data to improve the understanding of the hydrogeology from the source area(s) southwest to the harbor "cove" area and the migration of the CVOC plume in the central portion of Site 07, the following recommendations were made:

1. *For southwest extent from source: add five monitoring wells (MW07-35D, a shallow and deep overburden well pair at SB07-05, and a shallow and deep overburden well pair between MW07-04 and MW07-35).*

   Actions Taken: During the Spring of 2004, monitoring wells MW07-35D, 37S/D, and 38S/D were installed to refine the understanding of the southwest extent of CVOCs at Site 07. MW07-37S/D is located at SB07-05 along the western shoreline of Calf Pasture Point and MW07-38S/D is located between MW07-04 and MW07-35 (Figure 2-2).

   Results of Actions: These five monitoring wells were first sampled during ME 05 (August 2004) and have been sampled during each subsequent sampling event. Sampling data collected from the deep overburden wells indicate that the CVOC plume extends from the source area southwest to include MW07-35D, 37D, and 38D. No CVOCs have been detected in the shallow overburden aquifer at MW07-37S and very low concentrations of CVOCs have been detected in MW07-38S.

2. *For plume migration in the central portion of the site: add three monitoring wells (MW07-27S, and a shallow and deep overburden well pair approximately 125 to 150 feet to the east of MW07-26S).*

   Actions Taken: During the Spring of 2004, monitoring wells MW07-27S and 39S/I/D were installed to address uncertainties regarding plume migration in the central portion of Site 07. Monitoring well MW07-39I was installed based on observations made during boring advancement. The monitoring well cluster at MW07-39 is located approximately 150 feet east of MW07-26 (Figure 2-2).

   Results of Actions: These four monitoring wells were first sampled during ME 05 (August 2004) and have been sampled during each subsequent sampling event. In the shallow overburden aquifer, low levels of CVOCs have been detected in MW07-27S, but high concentrations of CVOCs have been detected in MW07-39S. High levels of CVOCs have been detected in MW09-39I and 39D during each of the last four monitoring events.

3. *To expand quantitative understanding of the harbor shoreline: add to ME 03 (February 2003) approximately 9 piezometer locations between P07-18 and P07-19 to cover the remaining portion of the harbor shoreline that had not previously been sampled.*

Actions Taken: Prior to ME 03 in February 2003, Navy installed nine additional piezometers (P07-25 to P07-33) in the locations described above.

Results of Actions: These piezometers have been sampled during each of the six monitoring events performed since February 2003. CVOCs have not been detected in samples collected from P07-26, 27, 29, 31, 32, or 33. Very low levels of CVOCs were detected in P07-25 and P07-28 during February 2003 and P07-30 during December 2003.

2.4.2 Issue 2: Recording of ELUR

A second issue identified in the first five-year review was the recording of the ELUR. As of February 2008, the ELUR for Parcel 9 has not been recorded. However, the Town submitted a revised draft ELUR to the Navy in late 2007, which was reviewed by the Navy and provided to EPA and RIDEM for review. The Navy has received comments from RIDEM on the ELUR. The ELUR is expected to be finalized and recorded during 2008.

2.5 FIVE-YEAR REVIEW PROCESS

In this section, a description of the five-year review process specific to Calf Pasture Point, including the document review, data review, and site inspection is provided. Basewide five-year review items, such as community involvement and interviews, are discussed in Section 1.0.

2.5.1 Document Review

A review of documents relevant to the remedial actions and long-term monitoring activities conducted at Calf Pasture Point was undertaken as part of the five-year review. The documents reviewed in order to complete the evaluation included Remedial Investigation reports and baseline risk assessments; the Feasibility Study, Proposed Plan, and Record of Decision; long-term monitoring work plans; long-term monitoring sampling data reports; supplemental long-term monitoring efforts such as the draft *Revised Conceptual Site Model and Monitoring Optimization Report* (Battelle, 2004 and 2008), *Coastal Contaminant Migration Monitoring Assessment* (SPAWAR, 2005), EPA *Plume Discharge Investigation* (EPA, 2005), *Sampling Recommendations to Minimize Impacts to Wetlands at Site 7* (Battelle, 2007), and the *Human Health Risk Assessment of Shoreline Surface Waters and Sediments, and Groundwater in Shallow Piezometers* (TtNUS, 2007l). For a complete list of documents that were reviewed during preparation of this document, please refer to the Reference section of this report.

2.5.2 Data Review

A review of Calf Pasture Point LTM data, and data collected to supplement the LTMP, was performed as part of the five-year review.

2.5.2.1 Long-Term Monitoring Program Data Review

As of this review, eight rounds of regularly-scheduled long-term monitoring have been completed at Calf Pasture Point (see in-text table in Section 2.3.2.1 for the dates of each round and the number of wells and piezometers sampled during each round). As provided for in the *Quality Assurance Project Plan for Long-Term Monitoring at Site 07* (EA, 2001a), a statistical analysis of analytical results for the contaminants-of-concern was completed. The results of the statistical analysis are summarized in this section and detailed in Appendix B.

A summary of chemicals exceeding project action limits in groundwater samples collected from Calf Pasture Point during the LTMP is provided in Tables 2-1 and 2-2. Appendix B provides contaminant concentration graphs for CVOCs detected in selected wells and piezometers during the LTMP, with an emphasis on those locations where CVOCs are present above project action limits.

Shallow Monitoring Wells

There are 24 shallow monitoring wells at Calf Pasture Point, 10 of which have been sampled during the LTMP at 9-month or 27-month intervals. During ME 08, three contingent monitoring wells were added for a total of 13 shallow monitoring wells. Shallow wells are screened in the upper sand unit, generally within 15 feet of the ground surface. Based on the results of the most recent sampling event in February/March 2007, a significant portion of the CVOC contaminant mass in the shallow overburden is concentrated in the central portion of Site 07 (monitoring wells MW07-19S and MW07-39S), with the highest concentrations detected in groundwater samples collected from MW07-39S. Minor detections of CVOCs were also present in samples collected from MW07-33S and MW07-36S, located near the western shoreline of Calf Pasture Point; and MW07-27S, located to the north of MW07-39S. A plan showing the distribution of total CVOCs in shallow monitoring wells at Calf Pasture Point during the February 2007 monitoring event is provided on Figure 2-4.

The concentrations of CVOCs detected in shallow monitoring wells at Calf Pasture Point have been relatively stable. As presented in Appendix B, the only shallow wells exhibiting a 95 percent statistically significant trend were MW07-19S (1,1,2,2-PCA increasing) and MW07-38S (*cis*-1,2-DCE decreasing). Statistics were also calculated for an 80 percent confidence interval, and only TCE in MW07-19S was determined to be increasing, whereas the concentrations of 1,1,2,2-PCA and TCE in MW07-33S were found to be decreasing. All other concentration trends in shallow monitoring wells (including MW07-39S) were not significantly different from zero.

Statistically-significant increasing concentrations of 1,1,2,2-PCA in MW07-19S suggest that the core of the CVOC plume in the shallow aquifer is migrating with the flow of groundwater from the center of the site toward the entrance channel. Monitoring well MW07-21S, downgradient from MW07-19S and the furthest well downgradient (i.e. closest to the shoreline) of the three containing greater than 1,000 µg/L total CVOCs, has been sampled during each of the first 8 monitoring rounds. A graph showing CVOC concentrations in MW07-21S over the course of the LTMP (individual chemicals) is presented on Figure B-14 (Appendix B). As evident from this graph, the concentrations of CVOCs in MW07-21S have fluctuated during the LTMP, but remain at the levels measured during the RI. The statistical analysis of CVOC concentrations in MW07-21S indicates that there has been no statistically-significant increase or decrease in this well during the LTMP. Section 2.5.2.2 provides a discussion of the current limits of the plume in the shallow zone compared to the limits of the plume at the time of the ROD.

Based on the evaluation of groundwater sampling data from shallow wells, the extent of the CVOC plume in the shallow aquifer is defined by MW07-38S, MW07-35S, MW07-36S, MW07-37S, and MW07-23S to the west; MW07-05S to the north; and MW07-13S to the east. Based on piezometer sampling results and off-shore investigation results (Section 2.5.2.2), the CVOC plume extends to the south into the entrance channel to Allen Harbor and to the west beneath the "western cove" area delineated by P07-15 and P07-16.

<u>Deep Monitoring Wells</u>

There are 32 deep monitoring wells at Calf Pasture Point, 22 of which have been sampled during the LTMP at 9-month or 27-month intervals. During ME 08, six contingent monitoring wells were added for a total of 28 deep monitoring wells. Deep wells are screened in the lower sand and till units that are present immediately above the bedrock throughout much of the site. Based on the results of the most recent sampling event in February/March 2007, a large plume extending from a source area in the vicinity of monitoring wells MW07-04D, 05D, 09D, 17D, 27D, and 39D is present in the deep overburden zone. The highest concentration of CVOCs is in MW07-17D, located in the northern portion of Site 07 but downgradient from the inferred location of the DANC release.

From this area of high concentration, a groundwater plume extends to the southwest, south, and southeast toward Allen Harbor, the entrance channel, and Narragansett Bay, respectively. Figure 2-5 shows the distribution of total CVOC concentrations deep overburden wells during ME 08. A comparison of the current distribution of CVOCs with the conditions observed during the RI indicates a general trend of lower concentrations in the upgradient portions of the plume (MW07-04D, 05D, 10D, 17D, and 25D) and higher concentrations in the downgradient portions of the plume (MW07-13D, 19D, 21D, 11D, and 34D). CVOC concentration graphs for select monitoring wells at Calf Pasture Point are provided in Appendix B.

The results of statistical trend analyses for the concentrations of 1,1,2,2-PCA, TCE, and *cis*-1,2-DCE are presented in Appendix B. These constituents were selected for statistical analysis since they are the CVOCs that were detected most frequently, and at the highest concentrations, in the Site 07 monitoring wells. Statistical analysis of CVOC concentration trends for deep monitoring wells supports the discussion provided in the previous paragraph. Statistically-significant (95 percent confidence) increasing trends were identified for at least one VOC in MW07-11D, 12D, 13D, 19D, 21D, and 34D. Statistically-significant decreasing trends were identified for at least one VOC in MW07-04D, 09D, 10D, 12D, 17D, 25D, and 37D. These data suggest that the core of the plume is migrating in the deep overburden from the inferred source area toward the south and southeast, and that the extent of the plume has increased to the southeast of the source area (MW07-11D).

New deep monitoring wells MW07-35D, 37D, and 38D were installed in 2004 to provide information regarding the migration of CVOCs from the source area to the southwest toward the western shoreline of Calf Pasture Point. CVOC concentrations in these wells have been steady, if not decreasing, since their construction in 2004, suggesting that the CVOC plume is not expanding in this direction. However, without data from prior years at these locations, it is not possible to determine whether significant increases or decreases in CVOC concentrations have occurred since the RI was completed in the 1990s.

Based on the evaluation of groundwater sampling data from deep overburden wells, the extent of the CVOC plume in the deep aquifer is defined by MW07-22D and MW07-28D to the north; MW07-29D, MW07-18D, and MW07-20D to the east; and MW07-24D to the southeast. The deep monitoring well data suggest that the limits of CVOC in deep groundwater extend below Allen Harbor to the west and south of Calf Pasture Point.

Bedrock Monitoring Wells

There are 7 bedrock monitoring wells at Calf Pasture Point, 5 of which have been sampled during the LTMP at 9-month or 27-month intervals. Bedrock wells are installed to a depth of approximately 60 to 80 feet below ground surface. Based on the results of the most recent sampling event in February/March 2007, the highest concentration of CVOCs in bedrock is present in MW07-05R, which is located in the northern portion of Site 07 at the southern edge (downgradient) of the inferred area of the DANC release.

Based on the limited number of bedrock monitoring wells present at the site, the primary route of CVOC migration from the inferred source area appears to be toward the entrance channel, as MW07-21R (located in the southern portion of the site immediately upgradient from the entrance channel) has contained elevated concentrations of CVOCs since the RI in the mid-1990s (8,390 µg/L in May 1996 and 12,400 µg/L in February 2007).

Statistical analysis of CVOC concentration trends in bedrock monitoring wells indicates increasing trends for TCE and *cis*-1,2-DCE in MW07-09R (95 percent confidence). A weaker (80 percent confidence) increasing trend was observed for *cis*-1,2-DCE in MW07-33R. These data suggest the migration of CVOCs in the bedrock aquifer from the source area toward the southeast and west (1,1,2,2-PCA in MW07-05R has decreased with 80 percent confidence). At least one CVOC exhibited a decreasing trend in MW07-21R and MW07-25R, which are located to the south and southwest, respectively, of the inferred source area.

Isoconcentration maps for CVOCs in the bedrock aquifer were not developed due to the limited number of monitoring points available.

Piezometers

Samples of shallow groundwater (2 to 3 feet below sediment surface) are collected from a network of 33 piezometers placed along the shoreline of Calf Pasture Point as part of the LTMP. The original LTMP included the collection of samples from 10 shoreline piezometers during each sampling round. However, as described in Section 2.3.2.1, piezometers were added to the LTMP during ME 02 (May 2002) and ME 03 (February 2003) based on the review of analytical data from samples collected during the first two monitoring events.

Chlorinated VOCs have not been consistently detected in the following piezometers during the LTMP, therefore written and graphical summaries of contaminant concentration trends are not included in this section: P07-01 through P07-03, P07-11 through P07-14, P07-17 through P07-19, and P07-25 through P07-33. The piezometers from which groundwater samples containing CVOCs have been collected are concentrated in two general areas: 1) the southern shoreline (including the entrance channel) and 2) the western cove area. Appendix B includes CVOC concentration graphs for piezometers located in these two areas.

The most significant detections of CVOCs in shallow groundwater along the shoreline of Calf Pasture Point have occurred in the entrance channel area delineated by P07-04 through P07-10 and P07-20 through P07-24 (Figure 2-2). The highest concentrations of CVOCs have historically been measured in

P07-07, P07-08, and P07-09, which are located along the shoreline in the entrance channel between MW07-21 and MW07-23. In general, the concentrations of CVOCs in these three piezometers were relatively low during the first three monitoring events, then increased dramatically during ME 04 (December 2003). Since ME 04, CVOC concentrations in P07-07 through P07-09 have decreased but remain elevated (approximately 2,000 to 3,000 µg/L). CVOCs have been detected consistently in other piezometers located in the entrance channel area, but at lower concentrations.

Since ME 04, the concentrations of CVOCs detected in samples collected from the entrance channel piezometers have been relatively stable. However, statistical analysis of concentration trends over the entire LTMP indicates increasing trends (95 percent confidence) for CVOCs in P07-07, P07-09, and P07-10, since CVOCs were present at lower levels in the early rounds of LTMP.

Two piezometers located in the western cove area (P07-15 and P07-16) have also consistently contained detectable concentrations of CVOCs. In P07-15, CVOCs were detected at lower levels until ME 05 (May 2005), when 46 µg/L total CVOCs were detected. P07-15 has exhibited 95 percent statistically-significant increasing trends for 1,1,2,2-PCA, TCE, and *cis*-1,2-DCE during the LTMP (Appendix B). In P07-16, CVOCs have increased from approximately 3 µg/L to approximately 16 µg/L, resulting in 80 percent statistically-significant increasing trends for TCE and *cis*-1,2-DCE.

Sediment and Surface Water Samples

Sediment samples are collected from the six shoreline locations collocated with the highest detections of VOCs in piezometers during each monitoring event. There are no project action limits for sediment because the RI did not identify unacceptable risks associated with exposure to sediment. The highest concentrations detected from SED07-09 (maximum concentration = 197 µg/kg Total CVOCs) and SED07-08 (maximum concentration = 106 µg/kg Total CVOCs).

Surface water samples were collected from SW07-04 through SW07-10 and SW07-24 during the bi-monthly sampling events conducted between October 2004 and January 2006. There are no project action limits for surface water because the RI did not identify unacceptable risks associated with exposure to surface water. The highest concentrations were detected in samples collected from the entrance channel at SW07-09 (131.2 µg/L Total CVOCs) and SW07-10 (124.4 µg/L Total CVOCs).

The data from sediment and surface water samples was utilized, along with data from shallow groundwater along the shoreline, to evaluate risks associated with swimming, wading, and shellfishing along the Calf Pasture Point shoreline. All of the cancer risk estimates developed for potential human exposure to chemicals of potential concern in sediment, surface water, and shallow groundwater while swimming, wading, or shellfishing were within the EPA's generally acceptable risk range and below RIDEM's cancer risk benchmarks. All of the non-cancer risk estimates associated with these exposures were below EPA and RIDEM risk benchmarks (TtNUS, 2007l). See Section 2.3.2.3 for a further description of the risk assessment methodology.

2.5.2.2 Comparison of Current and Historical CVOC Distribution in Groundwater

Figures 2-7 and 2-8 depict the distribution of total CVOCs in the shallow and deep overburden, respectively, at the time of the ROD. These figures are provided in comparison to Figures 2-4 and 2-5, which show the distribution of total CVOCs in each zone during the February/March 2007 sampling round. At first glance, when the overall size and internal distribution of individual contours are examined for each groundwater zone, one would conclude that the groundwater plume has advanced, perhaps significantly in areas, between the mid-1990s and the February/March 2007 sampling round.

However, when consideration is given to the fact that the initial CVOC distribution map was developed without the benefit of several newly installed wells, it is evident that while the plume has advanced in certain areas (for instance in the deep zone to east) the overall rate of advancement is slow. Of particular note is the disappearance of the 100,000 µg/L contour, yet limited advancement of the 10,000 µg/L contour, on the deep groundwater map, which suggests that there has been re-distribution of the CVOC mass but the limits of the high concentrations have remained fairly stable. The 1,000 µg/L contour has moved in both the shallow and deep groundwater zones suggesting some plume advancement, but the overall change in plume extent is not significant and mostly an artifact of additional data points/investigative work performed after the ROD.

2.5.2.3 Coastal Contaminant Migration Monitoring Assessment

In October 2004, in response to the increase in CVOC concentrations in shallow groundwater samples collected along the shoreline of Calf Pasture Point during ME 04 (December 2003), particularly in the entrance channel area, the Navy performed a Coastal Contaminant Migration Monitoring Assessment. The objective of this assessment was to determine the nature and extent of VOCs discharging to surface waters in Allen Harbor from Site 07 by identifying off-shore groundwater discharge zones and measuring VOC concentrations in these discharge zones.

The Coastal Contaminant Migration Monitoring Assessment was focused on the areas downgradient from the two clusters of piezometers where VOCs were detected during the LTMP: the entrance channel (P07-04 through P07-10) and the western cove area (P07-15 and P07-16). The assessment utilized a pore water screening probe to evaluate where groundwater may be discharging into the Harbor and a seepage meter/water sampling system to quantify groundwater discharge rates and chemical loading rates.

Using the pore water screening probe, potential groundwater discharge zones were identified by observing differences in conductivity and temperature that would suggest pore waters are comprised of groundwater rather than surface water. Pore water samples with higher temperatures and lower conductivities were identified as potential groundwater discharge zones. The results of the assessment suggested three primary zones where groundwater discharges from Site 07 into Allen Harbor: a) the northern end of the entrance channel between P07-07 and P07-10, b) the Allen Harbor side of the entrance channel to the west of P07-20, and c) downgradient from the western cove throughout the inner Harbor area.

Pore water and surface water samples were collected from a total of 16 locations in the inner Harbor area and 15 locations in the entrance channel area and analyzed for the presence of PCE; TCE; *cis*-1,2-DCE; *trans*-1,2-DCE, 1,1-DCE, and vinyl chloride. The results of sample analyses indicated that:

- TCE and *cis*-1,2-DCE were present at low concentrations in a pore water sample collected from the western cove area (downgradient from P07-16). *Cis*-1,2-DCE was also detected in the surface water sample collected from this location. No other VOCs were detected in any other pore water or surface water sampling locations within the inner harbor.

- The highest concentrations of VOCs were detected in pore water samples collected from the entrance channel area. TCE and *cis*-1,2-DCE were the VOCs detected at the highest concentration in pore water samples (153 µg/L and 178 µg/L, respectively, in samples collected to the south of P07-10).

- Other detections of VOCs in the entrance channel area suggested groundwater discharge zones along the entire width of the entrance channel extending from the P07-09/10 area south to Spink Neck.

Based on the findings of the pore water screening, these three potential discharge zones, plus one station identified by EPA, were selected for groundwater discharge measurements using a seepage meter. Based on the data collected using the seepage meter, the inner harbor area was identified as a positive discharge area and the three locations within the entrance channel exhibited varying levels positive discharge, with the highest being south of the area between P07-07 and P07-08.

Based on the results of pore water sampling and seepage meter measurements, the assessment concluded the following:

- A region of groundwater discharge is present in the entrance channel, south of the P07-07 through P07-09 area, which contains significant concentrations of VOCs.

- A second groundwater discharge zone is present at the northwestern extent of the entrance channel (west of P07-21), however VOCs were not detected in this area.

- A large region of groundwater discharge was identified in the inner harbor to the west of Calf Pasture Point, however no significant concentrations of VOCs were detected in this area. The northern and western extent of this discharge zone was not delineated during the assessment.

The assessment also concluded that significant VOC discharge is limited to the near-shore zone along the entrance channel adjacent to the southern shoreline of Calf Pasture Point and that the only exceedances of project action limits identified in pore water samples collected during the study were for vinyl chloride detected at a sampling station located adjacent to P07-10 (SPAWAR, 2005). See Figure 2-6 for a summary of vinyl chloride concentrations measured in pore water samples collected during the study. Note that, for this evaluation, pore water sampling results were compared to project action limits that were developed for piezometers, which are used to evaluate groundwater located 2 to 3 feet below the harbor.

2.5.2.4 EPA Plume Discharge Investigation

In October 2004, EPA conducted a Plume Discharge Investigation, which evaluated groundwater/surface water interactions along the shoreline at Site 07. The study included a screening along the shoreline to evaluate potential discharge or fresh-saltwater mixing zones based on the evaluation of temperature, resistivity, and conductivity data. The following methods were utilized to collect data for the study:

- A push probe with a temperature sensing device was used to measure surface water and subsurface water temperatures at various discrete locations and depths in order to determine potential groundwater discharge areas. Potential areas of groundwater discharge were identified in areas were a contrast between surface water and subsurface water was observed.

- Continuous Resistivity Profiling (CRP) was used to map the subsurface resistivity structure of the near-shore areas of Allen Harbor and locate potential areas of submarine groundwater discharge.

CRP was used for this investigation because of the sharp contrast in resistivity between salt and fresh water.

- Water column specific conductivity measurements were collected as a field screening method to define potential areas of freshwater input to the Harbor. Water column conductivity data were collected under the assumption that discharging freshwater causes a detectable change in surface water conductivity.

The screening data described above were used to select locations for pore water sample collection. Discrete location pore water samples were collected using stainless steel "Henry" samplers. Samples were generally collected from between 1.5 and 3.0 feet below ground surface. The conductivity of the water samples (e.g., pore water, seeps, and surface water) was measured with the Hach meter as a final screening step to estimate salinity. Samples with elevated conductivity (indicative of sea water) were generally not retained for analysis. All samples retained were analyzed for VOCs via EPA's on-site mobile gas chromatography lab within several hours of sample collection.

Based on the findings of the pore water screening, EPA reached the following conclusions: a) the plume discharge investigation refined and corroborated the primary area of VOC discharge along the shoreline in the Allen Harbor entrance channel; b) relatively high values for total VOCs detected in samples located just west of the breakwater appear to suggest another contaminant transport pathway, possibly related to the transport of VOCs through the bedrock, and c) the cove area on the western shoreline of Calf Pasture Point appears to be a general area of groundwater discharge to Allen Harbor.

2.5.2.5 EPA Conceptual Site Model Review

In April 2005, the EPA provided responses to the Navy's Draft Monitoring Event 05 (August 2004) Results Report, which included their review and re-evaluation of the Site 07 conceptual site model (CSM). In their comments, EPA stated that their evaluation of the data contained in the ME 05 report confirmed the presence of a CVOC plume that is migrating in several directions from the inferred source area located south of the former bunker locations and/or DANC burial trenches. The EPA stated their position that the plume at Site 07 was not at steady state or receding.

The EPA identified three primary pathways along which CVOCs were believed to be migrating: toward the southeast (Narragansett Bay), toward the south (Entrance Channel), and toward the southwest (Inner Harbor). The EPA noted that the Narragansett Bay and Inner Harbor pathways appeared to be focused primarily in the deep overburden aquifer, whereas the Entrance Channel pathway appeared to be distributed over the shallow, deep, and bedrock zones. The EPA concluded that the pathway of greatest

concern was the Entrance Channel pathway, where CVOCs were detected in all three intervals (shallow, deep, and rock) at the MW07-21 well cluster and in the shoreline piezometers. The EPA also concluded that the other two pathways did not appear to pose an imminent problem for the shoreline areas.
The recommendations provided by EPA in their comments included an increase in the frequency of sampling at Site 07, collection of groundwater samples from additional monitoring wells, additional hydraulic conductivity testing, further discussion of the available total organic carbon data for Site 07, and further evaluation of bedrock flow patterns.

2.5.2.6 Navy Revised Conceptual Site Model and Monitoring Optimization Report

In 2005, the Navy re-evaluated the CSM for Site 07 using all of the sampling data collected through the 8th long-term monitoring event, which was completed in February 2007. This CSM revision was an update of a previous document that re-evaluated the CSM using the data that were available in 2004. The objective of the document was to compile the available data to complete, support, and reinforce the CSM to verify that appropriateness of the remedy at Site 07. This document also provided recommendations for optimizing the long-term monitoring program at Site 07 based on the evaluation of the CSM and historical monitoring data.

Based on the evaluation of geological, hydrogeological, and chemical data collected during environmental investigations at Calf Pasture Point, the *Revised CSM and Monitoring Optimization Report* concluded the following:

- *The source of contamination within the plume has not been fully characterized.* Further investigation to delineate the limits of the source area was recommended.

- *Contaminants discharging into the Harbor may cause risk in the future.* Elevated concentrations of CVOCs have been detected in piezometers located in the entrance channel and in monitoring wells screened in the deep overburden near the shoreline. A recent risk assessment indicated that CVOCs present along the shoreline do not cause unacceptable risks to swimmers, waders, or shellfishermen, but if concentrations increase significantly, these risk estimates could change.

- *Additional off-shore monitoring may be required.* Upward vertical gradients observed near the shoreline in the deep overburden suggest that groundwater discharge is occurring beyond the limits of the piezometer network. Additional limited off-shore monitoring may be warranted to characterize risk associated with off-shore groundwater discharge.

- *Contaminant degradation is occurring at the site, but it is incomplete.* An evaluation of contaminant data suggests that 1,1,2,2-PCA, the primary anthropogenic contaminant released at the site, is undergoing degradation via multiple pathways. However, degradation reactions do not appear to be proceeding to completion or, if they are proceeding to completion, they are doing so at a rate that is too slow to prevent contamination from discharging to the surrounding surface water.

- *The dissolved groundwater plume is relatively stable.* Dissolved mass estimates developed in this document indicated that the dissolved groundwater plume is relatively stable, with some movement of mass within the limits of the plume, indicated by increasing and decreasing trends in individual monitoring wells.

- *Continued future monitoring is warranted.* Further monitoring is warranted to continue evaluating the distribution of CVOCs in groundwater and evaluating risks associated with contamination along the shoreline.

The report concluded that the site remedy is currently protective of human health and the environment, but that the data gaps identified raise concerns over the future protectiveness of the remedy. Recommendations for future monitoring were provided to optimize the long-term monitoring program.

2.5.3 Site Inspection

This section summarizes routine LTMP site inspection activities and the site inspection performed specifically for this five-year review.

2.5.3.1 LTMP Site Inspections

Site inspections are conducted every nine months at Calf Pasture Point in conjunction with each long-term monitoring event. During the inspection, each monitoring well is checked to ensure that it is locked, labeled, and in good condition. Observations are noted on a monitoring well inspection form that is included in Appendix A of the long-term monitoring results reports. The site inspection also includes an on-site verification of the effectiveness of land-use controls by observing land use conditions (presence of buildings and level of recreational use at the site) and evidence of groundwater extraction wells.

Review of site inspection forms completed during the LTMP indicates the following:

- All wells are locked and properly labeled.

- Approximately 1 foot of erosion has occurred between the concrete pad and the ground surface at monitoring wells MW07-16D, MW07-16R, and MW07-20S. These wells are located in sandy areas adjacent to the Narragansett Bay shoreline.

- Monitoring well MW07-33S was dry during the most recent sampling event in February 2007. There may be an obstruction in the well, possibly due to frost heaving.

Land-use control inspections performed during the LTMP have not detected any evidence of water supply wells or new construction (EA, 2002c, 2003a, 2004e; TtNUS, 2006b, 2006c, 2007h).

2.5.3.2 TtNUS Site Inspection

TtNUS performed a site inspection on 24 August 2007. The inspection included a site walkover and a review of documents at the North Kingstown Free Library. Photographs from the site inspection are included in Appendix C.

The site was observed to consist of a mix of forested, grassy, and sandy areas. The inspection began at Sanford Road, which runs to the west of the site, proceeded to the east along a gravel road, then south until reaching monitoring well MW07-23S. The inspection proceeded toward the east along the southern shoreline of Calf Pasture Point and monitoring wells MW07-21 and MW07-24 were observed. All wells encountered along the western and southern shorelines of the site appeared in good condition and the casings were locked.

The portion of the site adjacent to Narragansett Bay was observed next. While walking along the Narragansett Bay shoreline, two individuals were observed in the bay harvesting shellfish.

The inspection proceeded back to the starting point of the site walkover. Signs were observed along the southern perimeter of the site adjacent to Allen Harbor. One sign indicated that the area was closed to the public. Two other signs warned that swimming and wading was prohibited between the signs. The eastern most sign had fallen over and was nearly obscured by seagrass.

TtNUS personnel visited the North Kingstown Free Library. The reference librarian was interviewed regarding site documents present at the library. She indicated that site documents were located in a locked back room of the reference area. She indicated that a Navy consultant had recently deposited additional materials. The reference librarian stated that there was a high level of interest in the documents several years ago, but the level of interest has since diminished.

2.6 TECHNICAL ASSESSMENT

2.6.1 Question A: Is the remedy functioning as intended by the decision documents?

Based on the document review, data review, and site inspections, the remedy at Calf Pasture Point is functioning as intended by the ROD. Groundwater samples are collected from monitoring wells placed in the shallow, deep, and bedrock zones throughout the interior portions of Calf Pasture Point, and from shallow piezometers along the shoreline of Calf Pasture Point, on a 9-month sampling frequency.

Analytical data collected during each monitoring event is compared to project action limits: Maximum Contaminant Levels (Summer 2000) for monitoring wells and site-specific surface water risk-based screening concentrations for piezometers. The results from each monitoring round are presented in a data report with exceedances of project action limits highlighted in tables and shown on tag maps. In addition, total CVOC concentration trends from each sampling round between the RI (1995/1996) and the most recent round are presented in table form and on a tag map.

The remedy selected for Calf Pasture Point did not include active remediation because site groundwater is not likely to be used as a water supply and because an effective, implementable, and cost-effective technology to treat groundwater in fractured bedrock has not been identified. Instead, the remedial strategy for Site 07 utilizes institutional controls and long-term monitoring to mitigate and monitor risk from site-related contamination. The conceptual LTMP envisioned a long-term risk monitoring program that would be continually adjusted to achieve the objectives of the remedial action. Based on the evaluation of data collected during the LTMP, changes to the program have been implemented and supplemental data has been collected to verify that unacceptable risks are not present:

- Based on the review of sampling data during the first five-year review, nine new monitoring wells were installed at the site in 2004 to allow a better understanding of groundwater and contaminant flow patterns in the western cove and central portions of Site 07.

- Based on sampling results from the early rounds of monitoring, 23 new shoreline piezometers were added to the LTMP to enable more comprehensive monitoring of shallow groundwater along the Calf Pasture Point shoreline.

- After the detection of elevated concentrations of CVOCs in certain shoreline piezometers during the December 2003 sampling round, an off-shore investigation was conducted to identify potential groundwater and contaminant discharge zones in Allen Harbor.

- Concurrent with the performance of the off-shore investigation, the frequency of sampling at eight key piezometer locations within the entrance channel was increased to bi-monthly. Collocated surface water samples were also collected during these supplementary data collection events.

- Based on the data collected during bi-monthly piezometer and surface water sampling events, a human health risk assessment was performed to evaluate risks associated with potential exposures to shallow groundwater, surface water, and sediment along the Calf Pasture Point shoreline within the entrance channel.

As demonstrated by the supplemental monitoring and investigation discussed above, the remedy at Calf Pasture Point is meeting the RAO stated in the ROD to "ensure that the discharge of groundwater to wetlands and off-shore areas continues to pose no unacceptable risks from COCs." The current sampling network, with piezometers placed at approximately 50 foot spacing along the entire length of the Calf Pasture Point shoreline to monitor CVOC concentrations at the most likely points of human exposure, is adequate to evaluate the protectiveness of the remedy.

The second RAO identified for Calf Pasture Point in the ROD was to "prevent human exposure to COCs in deep and bedrock groundwater." To achieve this objective, the remedy includes environmental land use restrictions that a) prohibit the construction or development of any building, structure, or facility or other improvement without adequate ventilation and b) prohibit the installation of water supply wells, or use of groundwater for any purpose except for sampling or remediation. At least once per year, compliance with these controls is verified through a review of Town records to ensure that no permits have been issued that would change the use of the site, allow the construction of residential or commercial units, or allow the installation of groundwater supply wells. An on-site inspection is also conducted to verify that no buildings or water supply wells are installed on the site.

The concentrations of CVOCs in groundwater within the interior portions of Calf Pasture Point (in the shallow, deep, and bedrock aquifers) remain above project action limits approximately 8 years after selection of the site remedy. Based on the concentration levels and spatial distribution (both horizontal and vertical), project action limits are not expected to be achieved in the foreseeable future. As detailed in the preceding sections of this report, the Navy has expanded the monitoring network at Calf Pasture Point in several instances as a result of new findings regarding the extent of contamination at the site. As the cost of long-term monitoring at Calf Pasture Point increases, opportunities for remedy optimization have emerged. The *Revised Conceptual Site Model and Long-Term Monitoring Optimization Report* submitted in January 2008 and to be completed by the Navy during the spring of 2008 will evaluate optimization strategies for LTM at Calf Pasture Point.

2.6.2 Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Changes in Exposure Pathways: There have been no changes at the site that would have resulted in new exposure pathways to human or ecological receptors.

Changes in Land Use: There have been no changes in land use that would impact the protectiveness of the remedy. The property is used for passive recreation, with land-use controls to prevent exposures to contaminants in site groundwater. Periodic on-site inspections (Section 2.5.3) are conducted by the Navy to verify that land-use controls are effective.

The Town of North Kingstown has plans to develop trails on Calf Pasture Point, and construction of a parking lot is underway which will make the site more accessible to the public. Even with increased access to the site, the remedy will be protective so long as there are no water supply wells installed on the site and no unventilated buildings are constructed on the site.

New Contaminants and/or Contaminant Sources: There have been no new contaminants detected at the site since the first review and no new contaminant sources have been identified. However, there is some uncertainty regarding the extent of the CVOC source area.

Changes in Standards and TBCs: ARARs and TBCs considered during preparation of the ROD were reviewed to determine changes since the Long Term Monitoring Plan for Site 07 was issued. There have been no changes to currently relevant ARARs with the exception of monitoring criteria.

The primary monitoring criteria for the Calf Pasture Point site are the USEPA Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) and State Groundwater Quality Standards listed in Table 1 of RIDEM's Rules and Regulations for Groundwater Quality. The current USEPA MCLs are presented in EPA's Drinking Water and Health Advisory Table (USEPA, Summer 2006) and the State's Groundwater Quality Standards were updated in March 2005. The monitoring criteria were presented in Table 8-3 of the *QAPP for the Long Term Monitoring Plan for Site 07* (EA, May 2002). A comparison of the old and current groundwater monitoring criteria are presented in Table 2-3. As shown in the table, there have been no changes in the primary groundwater monitoring criteria for Site 07.

Additional monitoring criteria for Calf Pasture Point for surface water and sediment were listed in Table D-2 of the ROD. These values are the lesser of the federal AWQC and the RIDEM Water Quality Standards (WQS) and Ambient Water Quality Guidelines. As indicated in Table D-2, these criteria were to be used to monitor discharges of groundwater to shoreline/offshore sediment and surface water within the discharge area of the site, based on trends identified from groundwater data. The federal AWQC were last updated in 2006, and the Rhode Island WQS were last updated in July 2006. A review of the old and new values indicates that the changes in the AWQC and WQS would not impact the protectiveness of the remedy. A comparison of old and new AWQC and WQS values is provided on Table 2-4.

Changes in Toxicity and Other Contaminant Characteristics: There have been no changes in human health toxicity criteria that would impact the monitoring criteria. The toxicity factors (i.e., CSFs and RfDs) used in the human health risk assessment for Site 07 were obtained primarily from IRIS or other sources (e.g., HEAST) in 1995. The toxicity factors for some contaminants of concern at Site 07 have changed since that time. The most noticeable of these are beryllium; 1,1-dichloroethene; tetrachloroethene; trichloroethene; and PCBs.

- Beryllium and 1,1-dichloroethene are no longer classified as carcinogens for the oral route of exposure by the USEPA. Therefore, the risks calculated for these chemicals today would be significantly less than the risks calculated in the risk assessment.

- The CSFs currently recommended by the USEPA for tetrachloroethene and trichloroethene have increased by an order of magnitude or more since 1995 and, therefore, the risks calculated for these COCs would increase. However, these changes would not change the results and conclusions of the risk assessment and do not affect the values of the monitoring criteria (as shown in Tables 2-3 and 2-4) or the protectiveness of the remedy.

The CSF for PCBs used in the risk assessment is approximately 4 times greater than the value currently used. Therefore, the risks calculated for PCBs in shellfish in the risk assessment may be overestimated. For example, the risk for PCBs in shellfish was 2E-4. If the current CSF were used, the new risk for total PCBs would be 5E-5. It should be noted that the oral RfD for PCBs has not changed since the publication of the Phase III RI risk assessment. (The hazard index estimated for the consumer of locally caught shellfish reported in the Phase III risk assessment was 2).

A comparison of old versus new toxicity criteria values is provided on Table G-3 of Appendix G. A comparison of exposure factors used in the Site 07 risk assessment with currently used values is provided on Table G-4 of Appendix G.

Changes in Screening Criteria: When the risk assessment for Site 07 was conducted in 1996, the 1995 USEPA Region 3 RBCs were used as the basis of the COPC screening criteria for soil, groundwater and shellfish, in accordance with Region I policy. In 1999, Region I recommended that the Region 9 PRGs be used for screening instead of the Region 3 RBCs. Some Region 9 PRGs are based on different exposure assumptions and are generally lower than the Region 3 RBCs. For example, the Region 3 RBCs for soil are based on ingestion only but the Region 9 PRGs are based on the combined effects of ingestion, dermal contact, and inhalation. The differences in the values of RBCs and PRGs can be significant for some types of chemicals (especially volatile organics). However, a review of the COPC selection tables for the chemicals that changed significantly indicates that the list of COPCs would not change if the Region 9 values were used. A comparison of old versus new screening criteria values is provided on Tables G-5 through G-8 of Appendix G.

Changes in Risk Assessment Methods: There have been no major changes in HHRA methodology since the signing of the ROD that would impact the protectiveness of the remedy. Several changes in USEPA risk assessment methodology have occurred since the Phase III report was finalized in 1998. Among these are:

- The implementation of the USEPA's Dermal Guidance (RAGS-Part E) which was finalized in July 2004. Use of the RAGS-Part E guidance would result in slight changes in some dermal exposure parameters, such as exposed skin surface areas and dermal absorption factors. However, the affect of these changes on the calculated risks would be minimal and would not affect the results and conclusions of the risk assessment for Site 07.

- Calculation of exposure point concentrations (EPCs). EPCs for soil in the Phase III human health risk assessment for Site 07 were determined according to the *Supplemental Guidance to RAGs: Calculating the Concentration Term* (USEPA, May 1992). Using this guidance, risks for the reasonable maximum exposure (RME) were calculated using either the maximum detected concentration or the 95 percent UCL based on a lognormal distribution. New guidance for estimating EPCs was published in the USEPA's *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* (USEPA, December 2002) and the ProUCL guidance (USEPA, April 2007). The effects of using the new guidance on the Site 07 soil data are not known. However, because risks were based on maximum detected concentrations or lognormal 95 percent UCLs, it is unlikely that soil risks have been underestimated (risks for soil at the site ranged from approximately 1E-9 to 1E-7) by using the 1992 guidance.

- Carcinogens that Act by a Mutagenic Mode of Action. In March 2005, the USEPA provided general direction on implementing the USEPA's 2005 *Guidelines for Carcinogen Risk Assessment and Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens* because of special considerations for carcinogens that act via a mutagenic mode of action (e.g., vinyl chloride and PAHs). This guidance affects risks calculated for children and adolescents. For Site 07, this could, for example, potentially affect risks calculated for residential exposure to vinyl chloride in groundwater. The risks calculated for hypothetical residents assumed to be exposed to vinyl chloride in groundwater in the Phase III risk assessment exceeded 1E-3. If the new guidance were used, this risk would increase slightly but the results and conclusions of the risk assessment and the remedy for the site would not change.

Supporting risk assessment tables and calculations for the analysis presented in this section are found in Appendix G (Risk Assessment Support Documentation). It should be noted that the June 2007 human health risk assessment of environmental media along the Site 07 shoreline (Section 2.3.2.3) was conducted per current Navy and U.S. EPA risk assessment guidelines.

2.6.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The rationale for remedy selection at Site 07 was based, in part, upon the assumption that the extent of the plume was stable or decreasing. Based on an evaluation of the limits of the CVOC plume in 2007 versus 1995/96, some plume expansion has occurred to the east/southeast of the source area, and re-distribution of CVOC mass from the source area toward the south has occurred. These observations call into question the assumption that the extent of the plume is stable, which may impact the protectiveness of the remedy in the future.

2.6.4 Technical Assessment Summary

Based on the LTM data reviewed and site inspections, the remedy at Calf Pasture Point is functioning as intended by the ROD. Supplemental data collection and risk assessment have been conducted during LTM to monitor the protectiveness of the remedy. The results of these assessments have indicated that there are currently no unacceptable risks resulting from site-related contamination.

There have been no changes in physical conditions at the site that would affect the protectiveness of the remedy. There have been no changes to ARARs or TBC guidance that would impact the protectiveness of the remedy. Minor changes in risk assessment methods and the toxicity of contaminants that have occurred since the last review are not expected to adversely impact the remedy. The toxicity values, exposure assumptions, project action limits, and RAOs established at the time of the remedy selection and LTMP development are still valid.

Statistical analysis of data collected during the LTMP, and a comparison of the distribution of CVOCs in 2007 versus 1995/96, suggest that the extent of the dissolved CVOC plume may not be stable, which could impact the protectiveness of the remedy in the future.

2.7 ISSUES

Issue	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. LTM program needs to be reviewed/updated. CVOC plume expansion to the south and east suggests the plume may not be stable.	N	Y
2. Uncertainty regarding CVOC source area.	N	Y
3. Historical increase in CVOC concentrations in entrance channel piezometers.	N	Y
4. Increasing monitoring costs.	N	N
5. Risk communication to community.	N	N
6. Environmental Land Use Restriction has yet to be recorded.	N	Y

2.8 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Issue	Recommendations/Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1.	a) Finalize *Revised CSM and Monitoring Optimization Report for Site 07.* b) Schedule a DQO meeting to discuss optimization of the LTMP and establish the objectives and scope of the LTMP. c) Prepare a revised Work Plan/SAP for Long-Term Monitoring at Site 07.	Navy	EPA/ RIDEM	4/11/08 7/1/08 12/31/08	N	Y
2.	a) Schedule a DQO meeting to establish objectives and scope for source area investigation. b) Prepare a Work Plan/SAP to support the source area investigation.	Navy	EPA/ RIDEM	9/1/08 2/28/09	N	Y
3.	a) At the DQO meeting for LTMP, establish the objectives and scope for future shoreline monitoring. b) Develop trigger values for shoreline media to verify that CVOCs reaching the shoreline continue to pose no unacceptable risks. c) Develop decision matrix to guide decision making for shoreline monitoring program.	Navy	EPA/ RIDEM	7/1/08 9/1/08 9/1/08	N	Y
4.	a) Finalize *Revised CSM and Monitoring Optimization Report for Site 07.* b) At DQO meeting for LTMP, discuss optimization of LTMP. c) Based on results of source area investigation, consider source reduction technologies that might reduce long-term monitoring costs.	Navy	EPA/ RIDEM	4/11/08 7/1/08 10/1/09	N	N
5.	Develop fact sheet for Site 07 providing information to the public in laymen's terms regarding risks associated with planned activities and uses for Calf Pasture Point.	Navy	EPA/ RIDEM	6/1/08	N	N
6.	Work with the Town to expedite recording of the ELUR for Parcel 9.	Navy	EPA/ RIDEM	6/1/08	N	Y

2.9 PROTECTIVENESS STATEMENT

The remedy at Calf Pasture Point is currently protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being addressed through institutional controls that prevent exposure to contaminants in site groundwater. In order to ensure that the remedy continues to be protective in the long term, further investigation within the source area and along the shoreline is warranted. Additional investigations will include a source area investigation; the development of trigger values, based on the June 2007 risk assessment, for shoreline piezometers and sediment samples to determine whether concentrations reaching the shoreline pose unacceptable risks; and the development of a decision matrix to guide future actions should the trigger values be exceeded. The objectives and scope of these investigations will be developed through the *Data Quality Objectives (DQO) process as described in the Uniform Federal Policy for Quality Assurance Project Plans* (UFP-QAPP) Guidance.

3

3.0 ALLEN HARBOR LANDFILL

This section presents the findings of the five-year review for the remedy that was implemented at Navy IR Site 09 (Allen Harbor Landfill) at the former NCBC Davisville. The format of this section follows that which is presented in the EPA *Comprehensive Five-Year Review Guidance* (June 2001).

3.1 ALLEN HARBOR LANDFILL SITE CHRONOLOGY

Event	Date
Allen Harbor Landfill was used for the disposal of waste material generated by the former NCBC Davisville facility and NAS Quonset Point.	1946 - 1972
After landfilling operations had ceased, the landfill was closed by placing a discontinuous 2-foot soil cover over the fill materials.	1972
Completion of the *Initial Site Assessment of the former NCBC Davisville* (Hart, 1984).	9/1984
Completion of the *Verification Step - Confirmation Study of the former NCBC Davisville Facility* (TRC, 1987).	2/1987
EPA's Hazard Ranking Scoring Package for the former NCBC Davisville facility.	1989
NCBC Davisville facility placed on the CERCLA NPL.	11/21/1989
FFA signed by the Navy, EPA, and the State of Rhode Island.	3/1992
Remedial Investigation for Allen Harbor Landfill completed.	12/1996
Record of Decision signed.	9/29/1997
Submittal of Final *Design Analysis Report For Closure of the Allen Harbor Landfill* (EA, 1998c). Construction of landfill cap begins.	3/31/1998
Submittal of Draft *Allen Harbor Landfill Offshore Investigation Report* (EA, 1998c)	4/1998
Construction of landfill cap completed and Explanation of Significant Differences (ESD) submitted for polychlorinated biphenyl (PCB)-contaminated soil removal and extension of the soil cap and the revetment (EA, 1999a).	8/1999
First Quarterly Landfill Inspection	12/29/1999
Second Quarterly Landfill Inspection.	3/30/2000
2000 Annual Landfill Settlement Survey.	4/2000
Final *Remedial Action Report for Site 09-Allen Harbor Landfill Cap* (FWENC, 2000b).	6/2000
Class I survey of Parcel 10 completed and annotated with references to the deed for groundwater use and land-use restrictions.	11/2000
FOST to transfer Parcel 10 to the U.S. Department of Interior for transfer to the Town of North Kingstown, Rhode Island (Navy, 2000).	12/14/2000
Final Conceptual Long-Term Monitoring Plan (CLTMP) which included establishment of the performance standards (Newfields, 2000b).	12/22/2000
Final Remedial Action Operations and Long-Term Management Plan for Allen Harbor Landfill (FWENC, 2001a).	5/2001
Work Plan Addendum No. 2 and Installation of MW09-25S as agreed to in the CLTMP.	7/2001
Final Landscape Plan for Allen Harbor Landfill (Beckman-Weremay, 2001).	10/2001
Final QAPP for Long-Term Monitoring of Site 09 (EA, 2001b).	11/2001
LTMP initiated with ME 01.	11/30/2001
2001 Annual Landfill Settlement Survey.	12/2001
Final LUCIP that includes the inspection procedures for Site 09 to document compliance with the land-use controls and/or deed covenants placed by the Navy on this transferred Navy property (Parcel 10) (EA, 2002b).	1/2002

Event	Date
Final LUCIP Annual Letter Report documenting compliance with land-use controls for Parcel 10 (Allen Harbor Landfill) during 2001 (EA, 2002c).	2/14/2002
ME 02 sampling.	2/2002
ME 03 sampling.	6/2002
ME 04 sampling.	9/2002
ME 05 sampling.	1/2003
Signature date of the First Five-Year Review Report for the NCBC Davisville facility.	3/30/2003
ME 06 sampling.	4/2003
Semi-Annual Landfill/Wetland Inspection 3; 2003 Annual Landfill Settlement Survey.	5/2003
ME 07 sampling.	6/2003
ME 08 sampling. Semi-Annual Landfill/Wetland Inspection 4.	9/2003
ME 09 sampling.	12/2003
Final LUCIP Annual Letter Report documenting compliance with land-use controls for Parcel 10 (Allen Harbor Landfill) during 2003 (EA, 2004e).	2/11/2004
ME 10 sampling.	3/2004
Parcel 10 transferred.	5/10/2004
Parcel 10 ELUR recorded.	6/8/2004
ME 11 sampling.	6/2004
Semi-Annual Landfill/Wetland Inspection 5.	7/2004
ME 12 sampling.	8/2004
ME 13 sampling.	10/2004
ME 14 sampling.	3/2005
ME 15 sampling.	6/2005
Semi-Annual Landfill/Wetland Inspection 7.	7/2005
2005 Annual Landfill Settlement Survey.	8/2005
Event	Date
ME 16 sampling.	9/2005
ME 17 sampling.	12/2005
ME 18 sampling.	3/2006
Final LUCIP Annual Letter Report documenting compliance with land-use controls for Parcel 10 (Allen Harbor Landfill) during 2004 (TtNUS, 2006b).	6/12/2006
Final LUCIP Annual Letter Report documenting compliance with land-use controls for Parcel 10 (Allen Harbor Landfill) during 2005 (TtNUS, 2006c).	8/15/2006
Draft 2005 Annual Data Summary Report, including evaluation of LTM data collected during the first 15 rounds of quarterly monitoring at Allen Harbor Landfill (TtNUS, 2007d).	9/2006
ME 19 sampling. 2006 Annual Landfill Settlement Survey.	11/2006
ME 20 sampling.	3/2007
Final LUCIP Annual Letter Report documenting compliance with land-use controls for Parcel 10 (Allen Harbor Landfill) during 2006 (TtNUS, 2007h).	5/21/2007
Inspection of constructed wetland to assess shellfish populations (TtNUS, 2007m).	5/22/2007
Well integrity inspection at Site 09 to assess status of "damaged" wells (TtNUS, 2007n).	5/23/2007
ME 21 sampling.	6/2007
ME 22 sampling	11/2007

3.2 ALLEN HARBOR LANDFILL BACKGROUND INFORMATION

In this section, background information for Allen Harbor Landfill such as physical characteristics, current and former land use, and a history of environmental actions is presented.

3.2.1 Physical Characteristics

Allen Harbor Landfill is located in the Main Center of the former NCBC Davisville facility, within Parcel 10 as shown on Figure 2-1. Allen Harbor Landfill is an approximately 15-acre grassy area formerly used by the Navy as a landfill. The Site is located within a 100-year floodplain, bounded to the east by Allen Harbor, to the west by Sanford Road, and to the north and south by vegetated wetlands. Allen Harbor is used for recreational boating and is supported by two marinas. In 1984, RIDEM closed Allen Harbor to shellfishing due to suspected contamination from several sources, including Site 09.

The ground surface of Allen Harbor Landfill is currently covered with grass and small shrubs. In general, the terrain at the landfill is gently sloping with a topographic high in the middle. A revetment wall and constructed wetland are located along the southern and eastern boundary of the landfill with a stone breakwater structure separating the wetland from the Harbor (Figure 3-1).

No groundwater production wells are located on, or down gradient of, the site. Groundwater at the site is classified by RIDEM as GB (i.e., presumed to be not suitable for public or private drinking water use without treatment).

3.2.2 Land and Resource Use

Between 1946 and 1972, the Allen Harbor Landfill was used for the disposal of waste material generated by NCBC Davisville and NAS Quonset Point. Currently, the site is undeveloped property with a ground cover of grass and small shrubs over a multimedia landfill cap. Parcel 10, which includes Site 09, is currently owned by the Town of North Kingstown after being transferred from the Navy via the U.S. Department of the Interior. In the future, Allen Harbor Landfill will not be used for residential purposes due to environmental land use restrictions placed on the property as required by the ROD. The Town's planned use of the property is as open space/conservation land.

In accordance with the deed, ELUR, and LUCIP (EA, 2002b), Parcel 10 includes the following environmental land-use restrictions:

- That the entire parcel is used only for park and recreational uses, not for residential or commercial use, as stated in the ROD.
- For the entire parcel, water supply wells shall not be installed, nor shall groundwater be utilized except for sampling or other remedial purposes.

- That the contaminated site as delineated on Figure 3-2 (land-use restriction boundary) is used by the Grantee, its successors, and assigns, for pedestrian traffic only. Restrictions include, but are not limited to: digging, use of motorized vehicles, or other activities that may damage the remedy components (multimedia cap, gas vents, monitoring wells, stone revetment, etc.) or otherwise allow direct exposure to hazardous waste under the cap.

LUCIP inspections of Parcel 10 are performed in conjunction with each Site 09 monitoring event, but no less frequently than annually, to document that there has been no variance from the environmental land-use restrictions stated above.

3.2.3 History of Contamination

A 1939 aerial photograph of the Allen Harbor area depicts the landfill as an undeveloped open grass field lined with shrubs and bushes. From 1946 to 1972, the Allen Harbor Landfill was used for the disposal of waste material including municipal-type waste, construction debris, rubble, preservatives, paint thinners, degreasers (e.g., solvents), PCB, oil, asbestos, ash, sewage sludge, and waste fuel oil. Disposal activities usually included burning the waste and covering it with soil. In 1972, after land filling operations had ceased, the landfill was closed by placing a discontinuous 2-foot soil cover over the fill materials.

Prior to construction of the cap portion of the site remedy (in 1998), the Allen Harbor Landfill was vegetated similar to typical upland coastal areas (i.e., grasses/perennials, shrub communities, and deciduous forest components) which provided habitat for numerous species of birds and mammals. Also, building debris and rusted metallic objects were visible at various locations across the site, including the site shoreline and harbor-side face of the landfill.

3.2.4 Initial Response

In 1972, after landfilling operations had ceased, the landfill was closed by placing a discontinuous 2-foot soil cover over the fill materials.

3.2.5 Basis for Taking Action

Groundwater data from the RI indicated the presence of elevated concentrations of VOCs and low concentrations of PAH, pesticides, and metals. Elevated concentrations of PAH, pesticides, PCBs, and metals were detected in surface and subsurface soil samples. Semi-volatile organic compounds (SVOCs), pesticides, PCBs, and metals were detected in sediment samples throughout the Harbor.

According to the human health risk assessment completed during the RI, the contaminants with cancer risk greater than 10^{-4} and/or HI greater than 1.0 included the following:

Groundwater		Sediment	Shellfish
Arsenic	1,2-Dichloroethene (total)	Heavy metals	Arsenic
Manganese	1,2-Dichloropropane	PAH	Copper
bis(2-chloroethyl)ether	TCE	PCBs	Zinc
1,2-Dichloroethane	Vinyl chloride		Aroclor 1254
			Aroclor 1260

The human health risks that exceeded risk management goals at Site 09 were associated with the following exposure scenarios:

- The potential ingestion of deep groundwater by future residents,
- The use of site groundwater for showering in a potential recreational facility,
- Dermal contact with or incidental ingestion of site surface soil by recreational users of the site,
- Incidental ingestion of shoreline sediment by recreational users of the site, and
- Consumption of shellfish from the site shoreline.

Potential health risks to site workers during remedial activities were associated with the incidental ingestion of soil (EA, 1996c).

Ecological risks to marine organisms in Allen Harbor were reported to be "moderate" to "slight." Moderate risk to marine organisms was reported to be limited to the narrow inter tidal zone to the north and south of the site. Risks to terrestrial ecological receptors were reported to be moderate to high within the Allen Harbor Watershed (an area in which the Allen Harbor Landfill was one of the contributors to elevated risk) (EA, 1996c).

3.3 REMEDIAL ACTIONS

This section discusses the remedy selection and implementation history for Allen Harbor Landfill, along with a discussion of the long-term monitoring program currently in place at Site 09.

3.3.1 Remedy Selection

The ROD for Site 09 was signed on 29 September 1997 and includes the following components: the construction of a multimedia cap (including a gas venting system), stone shoreline revetment, an offshore breakwater, and the construction of inter tidal wetlands, along with LTM and land-use controls. RIDEM concurred with the remedy on 25 September 1997.

As stated in the ROD, the Remedial Action Objectives (RAO) for Allen Harbor Landfill are as follows:

Surface Soil

- Prevent human and terrestrial animal exposure to COC in surface soil
- Prevent offsite migration of surface soil and surface soil constituents through overland runoff

Subsurface Soil

- Reduce leachate generation
- Reduce or eliminate surface erosion and exposure of fill materials along landfill shoreline

Groundwater

- Prevent human exposure to COC in deep groundwater

Sediment

- Minimize risks from marine ecological exposure to COC in sediment
- Control potential future sediment contamination from landfill constituents

Wetlands

- Control potential future contamination of wetlands from landfill constituents
- Improve quality of existing wetlands and create new wetlands onsite along the shoreline

Shellfish

- Control potential future contamination of shellfish from landfill constituents
- Prevent or minimize human ingestion of shellfish from the landfill shoreline containing COC above health advisory concentrations.

Based upon the results of the Remedial Investigation/Feasibility Study (RI/FS), and the community response to the Proposed Plan, the selected remedy for Site 09 was Alternative 3 - Multimedia Cap. A complete description of the selected alternative is presented in Section VIII of the ROD (EA, 1997) and in the ESD of August 1999 (EA, 1999a).

The EPA's *Presumptive Remedy for CERCLA Municipal Landfill Sites* directive (OSWER Directive 9355.0-49FS) states that containment technologies are the preferred remedies for municipal-type landfill waste. Accordingly, cleanup goals (i.e., treatment goals) were not developed as part of the Site 09 remedy. The components of the selected alternative address the identified risk pathways and the RAOs identified for Site 09. The LTM program established as part of the selected alternative was designed to ensure the protection of human health and the environment over time. The selected remedial alternative includes the following components:

- Construction of a multimedia cap above the 100-year storm elevation (14 feet above MSL) that consists of multiple soil layers and two impermeable layers, and a soil cap in the area below 14 ft MSL to comply with current federal and state laws. This component of the remedy addressed the RAOs for surface and subsurface soil.

- Construction of a passive gas venting system was included in the cap system. Landfill gases collected within the gas vent layer are passively vented to the atmosphere via five vents at the landfill. The points of discharge (vents) were fenced in order to protect potential site visitors.

- Removal and/or covering of landfill debris from the landfill shoreline. This addressed the RAOs for surface soil, sediment, and shellfish.

- Construction of a stone revetment along the shoreline of Site 09 to protect the landfill face from wave action (e.g., tidal forces and storm events). This stabilization of the landfill face addressed the RAOs for surface soil, sediment, and shellfish.

- Construction of a breakwater structure just east of a majority of the revetment wall, along with construction of a wetland area between the revetment wall and breakwater structure, which together act to trip waves and reduce energy reaching the revetment. Construction of this wetland area along the shoreline of the site also serves as a natural resources/habitat improvement which utilized material dredged from the entrance channel to Allen Harbor. The progression of wetland development is being monitored over time to verify its sustainability. This addressed the RAOs for sediment, shellfish, and wetlands.

- Establishment of institutional controls as follows (addressing the RAO for groundwater):

- Implementation of land-use restrictions that include deed restrictions regarding site and groundwater use,

- Implementation of appropriate land-use restrictions (no use of motorized vehicles, no digging, no deep-rooted vegetation) to protect human health and the environment through limiting site development to maintain the integrity of the cap, and

- Prevention of the installation or use of ground-water wells, which would be used for drinking water or showering purposes.

- Conduct long-term monitoring of landfill gas, groundwater, sediment, and shellfish quality to evaluate the effectiveness of the remedy.

- Five-year reviews of the decision for the site by the Navy, EPA, and RIDEM.

A Rhode Island prohibition on the collection of shellfish from Allen Harbor addresses human health risks associated with the ingestion of shellfish from the landfill shoreline. As part of the remedy for Allen Harbor Landfill, the Navy maintains signage along the landfill shoreline to warn the public about the shellfishing ban.

The Navy and EPA signed the ROD in September 1997, which declared that the selected remedy is protective of human health and the environment, complies with current federal and state applicable or relevant and appropriate requirements (ARARs), and is cost effective (EA, 1997).

3.3.2 Remedy Implementation

On 31 March 1998, the Final *Design Analysis Report for Closure of the Allen Harbor Landfill* (EA, 1998c) was submitted and the capping activity commenced. FWENC completed the remedial action in August 1999 (FWENC, 2000b). In addition to the remediation activities outlined in the ROD, a removal action was performed by FWENC in the Spring of 1999 when the presence of PCB-contaminated soil was discovered at the northern end of the landfill. Due to the PCB removal conducted as part of the remedy for this site, an ESD was submitted as part of the ROD in August 1999. The ESD did not fundamentally alter the remedy at the site. The ESD included the PCB-contaminated soil removal and a northerly extension of the soil cap and the revetment.

3.3.2.1 Remedy Operations and Maintenance

On 30 March 2000, quarterly physical inspections of the landfill were initiated. Landfill inspections were performed quarterly for the first two years and have been required semi-annually since 2002. Semi-annual landfill inspections are completed in accordance with the Final *Remedial Action Operations and Long-Term Management Plan for Allen Harbor Landfill* (FWENC, 2001a) and maintenance/repairs are performed on an as-needed basis based on the findings of the inspections.

The primary activities associated with operation and maintenance (O&M) of the landfill include:

- Visual inspection of the landfill cap with regard to vegetative cover, settlement, erosion, and need for corrective action.

- Inspection of the storm drainage system for sediment accumulation, erosion, vegetative growth, ponding, and obstructions.

- Inspection of the condition of the gas vents and monitoring wells.

- Inspection of the revetment slope and breakwater structure for areas of sliding or stone displacement.

- Inspection of the constructed wetland, the planted wetland in the former barge area just north of the capped area, and the wetland enhancement area located along the northwest corner of Allen Harbor for plant percent survivability physical appearance, density of growth, and presence of invasive wetland plant species.

- Inspection of shellfish in the constructed wetland regarding presence (establishment of a population), general location, extent, and abundance of ribbed mussels, hard or soft-shell clams, and oysters.

Operation and maintenance, or post-closure care, at the Allen Harbor Landfill must be performed for 30 years after the landfill closure in accordance with Resource Conservation and Recovery Act (RCRA) requirements in 40 CFR Parts F, G, and N, Section 2.1.09(c) of the RIDEM Office of Waste Management Solid Waste Regulation No. 2 - Solid Waste Landfills, and the ROD. Five-year reviews must be conducted at least once every 5 years as long as contamination remains above levels that allow for unlimited use and unrestricted exposure.

Landfill settlement surveys are conducted annually at each monitoring well, each gas vent, and at six locations each on the revetment and breakwater to monitor subsidence in the landfill and along the shoreline. Settlement survey data is reviewed to determine if subsidence has exceeded the acceptable range of 6 inches over any 100 linear foot area of the landfill cap.

Based upon the landfill inspections from 2000 through 2007, it appears that overall the site remedy is in good condition and functioning according to design, including the cap, revetment slope, and breakwater structure. Based on the settlement survey results, there has been minor subsidence in a few areas, but this has not exceeded the acceptable range (EA, 2003e; ECC, 2004a, 2004b, 2005, and 2007; Crossman, 2006). Additional detail regarding the maintenance activities that have occurred since the first five-year review is provided in Section 3.4.2.

3.3.2.2 Land-Use Control Implementation Plan (LUCIP)

On 30 November 2001, LUCIP inspections were initiated with ME 01. LUCIP inspections are performed in accordance with the Final *QAPP for LTM at Site 09* (EA, 2001b and 2003b) and the Final *Land-Use Control Implementation Plan* (EA, 2002b). Land-use control inspections have been performed during each monitoring event at Allen Harbor Landfill to verify compliance with the land-use restrictions established as part of the site remedy (Section 3.3.1). Copies of the institutional control inspection checklists are included in each of the quarterly monitoring event reports. Compliance with land-use controls is documented annually in the LUCIP Annual Letter Reports.

Based on the Institutional Control Inspections completed during ME 01 through ME 22 and the LUCIP Annual Letter Reports, there was compliance with the institutional controls stated in the ROD and Final LUCIP (EA, 2002c, 2003a, 2004e; TtNUS, 2006b, 2006c, and 2007h).

3.3.2.3 Long-Term Monitoring

LTM at Allen Harbor Landfill commenced during December of 2001. The scope of the baseline LTMP in the *QAPP for LTM at Site 09* included quarterly sampling from 20 monitoring wells, 10 piezometers, 10 sediment locations, 5 gas vents, and 28 temporary gas probe locations. With the exception of some piezometer sampling locations that were unable to be sampled during the early rounds of LTMP (see Section 3.4.1), quarterly monitoring events have met the completeness objectives established in the QAPP (however two monitoring wells have not been sampled during the LTMP due to damage incurred during cap construction). The following table provides a summary of monitoring events completed at Allen Harbor Landfill to date:

Monitoring Event	Date	Monitoring Event	Date
ME 01	December 2001	ME 12	August 2004
ME 02	March 2002	ME 13	October 2004
ME 03	June 2002	ME 14	March 2005
ME 04	September 2002	ME 15	June 2005
ME 05	January 2003	ME 16	September 2005
ME 06	May 2003	ME 17	December 2005
ME 07	June 2003	ME 18	March 2006
ME 08	September 2003	ME 19	November 2006
ME 09	December 2003	ME 20	March 2007
ME 10	March 2004	ME 21	June 2007
ME 11	June 2004	ME 22	November 2007

Based on the sampling results from ME 01 through ME 15, the Navy completed a data summary report with statistical analyses to evaluate baseline data and propose alterations to the LTMP sampling network. Based on the conclusions of this report, the evaluation of data collected during ME 16 through ME 19, and discussions with the BCT, changes to the LTMP were planned. These changes will include the addition of up to 8 monitoring wells and two piezometers to the LTMP sampling network and the refinement of analytical parameters to exclude those which have not been detected at significant levels during the LTMP. A revision to the *QAPP for Long-Term Monitoring at Site 09 (Allen Harbor Landfill)* was developed by the Navy in November 2007 to document the changes that were agreed upon by the BCT, and well/piezometer installation activities commenced in December 2007.

Monitoring wells MW09-26S, 26D, 27S, and 27D; and piezometers P09-11 and P09-12; were installed during December 2007 (Figure 3-3). These locations (plus MW09-17I) were sampled during the first monitoring round of 2008. The Navy will attempt to repair damaged monitoring wells located within the landfill cap area (MW09-09D and MW09-14I) during the spring of 2008.

The baseline LTMP anticipated at least one round of shellfish sampling from the constructed wetlands prior to the first five-year review to evaluate impacts to shellfish along the landfill shoreline resulting from site-related contaminants. The LTMP specified the collection of shellfish (bivalve) tissue samples on an annual basis from the constructed wetland so that concentration trends could be evaluated (EA, 2001b and 2003b). RIDEM has been requesting the shellfish samples be collected from in front of the breakwater to ascertain if VOCs, PCBs, or metals are migrating from the landfill.

The first five-year review was conducted in 2003, but shellfish sampling did not occur because shellfish had not re-colonized the constructed wetland. In May 2007, the Navy conducted a shellfish assessment in the constructed wetland and determined that sufficient numbers of bivalves were not present to support sampling. In August 2007, abundant ribbed mussels were observed along the southern and northern shorelines of the landfill (outside of the constructed wetland).

During December 2007, the Navy collected shellfish samples from the landfill shoreline in the P09-01, P09-09, and P09-10 areas. This was the first shellfish sampling round conducted since the inception of the LTMP. Two samples of ribbed mussels were collected from the P09-01 area and two samples were collected from the P09-09/10 area. In addition, reference samples were collected from Fishing Cove in Wickford, Rhode Island and from the shoreline of Prudence Island, located in Narragansett Bay, to evaluate the anthropogenic background levels of contamination present in similar marshy areas within or adjacent to Narragansett Bay.

3.4 PROGRESS SINCE THE LAST REVIEW

The first five-year review, conducted in 2003, concluded that a protectiveness statement could not be made at the time until further information was collected. The rationale for this conclusion was that the LTMP stated that "8 rounds of sampling will be completed prior to determining the protectiveness of the cap." As of the first five-year review for the site, only three rounds of monitoring had been completed. Further, at the time of the first five-year review, the Navy was having difficulty collecting samples from shoreline piezometers due to very low recharge, which prevented the analysis of samples for the full parameter list included in the LTM QAPP. The first five-year review did state that the remedy was expected to be protective of human health and the environment as long as the landfill cap and institutional controls remain in place.

This section presents the recommendations and follow-up actions that were included in the first five-year review, with a brief description of the actions taken by the Navy since the last review.

3.4.1 Issue 1: Inadequate Monitoring Data

To address the issue of inadequate monitoring data, the following recommendations were made:

1. *Continue to attempt to obtain all planned piezometer sample aliquots for analysis; particularly the salinity aliquot to aid assessment of the representativeness of groundwater discharge.*

   Actions Taken: During ME 06 sampling in April 2003 (the first monitoring event after completion of the five-year review), the Navy installed additional collocated piezometers at 8 of the 10 shoreline piezometer locations to facilitate the collection of samples. The additional piezometers enabled the collection of sufficient sample volume so that samples could be analyzed for the full analytical parameter list. Previously, adequate sample volume could not be extracted from a single piezometer in the time frame available between low tide and mid tide.

The total number of shoreline piezometers required at each sampling location to collect sufficient volume for all analyses was determined based on the location of the piezometer and the historical rate at which the piezometer recharged. The following table provides a summary of the number of piezometers present at each location:

Piezometer Location	Number of PZs	Piezometer Location	Number of PZs
P09-01	8	P09-06	4
P09-02	3	P09-07	2
P09-03	3	P09-08	1
P09-04	2	P09-09	4
P09-05	3	P09-10	1

Results of Actions: Since ME 06, the completeness of the shoreline piezometer sampling analytical results has improved considerably. Between ME 06 (April/May 2003) and ME 13 (October 2004), shoreline piezometer samples from all 10 piezometers were analyzed for the full parameter list. The following is a summary of analytical parameters that were not included in recent monitoring rounds:

- During ME 14 (March 2005), P09-09 and P09-10 were not analyzed for pesticides or SVOCs and P09-10 was not analyzed for PAH or PCBs.
- During ME 15 (June 2005), P09-09 was not analyzed for pesticides or SVOCs.
- During ME 18 (March 2006), P09-09 was not analyzed for pesticides or SVOCs.
- During ME 19 (November 2006) P09-09 was not analyzed for PAHs.

During ME 16, 17, and 20 sufficient sample volume was extracted to analyze samples for all planned analytical parameters.

2. *Evaluation of the need for abandonment and replacement of MW09-14I and MW09-09D after evaluation of the ME 08 results.*

Actions Taken: ME 08 was completed in September 2003. The Navy did not complete a formal evaluation of LTM sampling results after ME 08. An evaluation of sampling data, with statistical analyses and recommendations for future monitoring, was completed after ME 15 and presented in the draft 2005 Annual Data Summary Report dated September 2006. After receiving comments from EPA and RIDEM on this document, responding to these comments, and discussing future plans for monitoring at Allen Harbor Landfill with the BCT on 19 July 2007, the Navy has decided to abandon and replace these wells.

Results of Actions: Navy will attempt to repair these wells. If they cannot be repaired, they will be replaced.

3.4.2 Issue 2: Maintenance of the Landfill Cap

To address the issue of landfill cap maintenance, the following recommendations were made:

1. *Repair of rutting in the LTMP dirt access roads.*

   Actions Taken: During 2005, ruts in the dirt access road were filled in three locations after evidence of a ramp for a single track vehicle (i.e. dirt bike) was observed on the landfill (ECC, 2005). Filling activities were limited to these three areas, however, and minor vehicle ruts were still present in certain areas of the dirt access roads during a 2006 inspection (ECC, 2007).

   During November 2007, the western entrance ramp was repaired by removing topsoil and placing 6 inches of gravel over the rutted and eroded area adjacent to the access gate. The area repaired was approximately 25 feet wide by 100 feet long. Also, vehicle ruts in the dirt access road were filled with gravel to stabilize the roadway and bring the road surface back to the intended grade.

2. *Removal of vegetation from drainage pipe outlets and the southern drainage swale.*

   Actions Taken: During November 2007, vegetation was removed from the pipe outlets, the southern drainage swale, and the shoreline revetment.

3. *Re-seeding of bare spots on the cap surface.*

   Actions Taken: During subsequent inspections, the bare spots on the landfill cap that were identified in 2003 had been revegetated and no actions were taken (ECC, 2007).

4. *Consider installation of additional geotextile over the area east of piezometer P09-03 where there appears to be some channeling of tidal waters through the breakwater structure.*

   Actions Taken: No actions taken to date. Subsequent inspections of the landfill have reported that channeling of waters through the breakwater structure has not resulted in significant erosion (ECC, 2004a, 2004b, 2005, and 2007).

5. *Repair of the small sections of exposed geotextile fabric along the top and toe of the revetment and the breakwater structure.*

   Actions Taken: No actions taken to date. Subsequent inspections of these areas have concluded that the areas of exposed geotextile are minor and not detrimental to the function of the cap (ECC, 2004a, 2004b, 2005, and 2007).

6. *Removal of two large shrubs in the vicinity of gas vent GV09-05 as a precaution so their roots do not impact the multimedia cap.*

   Actions Taken: These shrubs were removed during the spring of 2003 (EA, 2003e).

3.4.3 Issue 3: Constructed Wetland Plant Sustainability

The following recommendation was provided in the first five-year review to address the issue of constructed wetland plant sustainability: *Assess whether or not replanting of the southern portion of the constructed wetland is appropriate.*

Actions Taken: No actions taken to date. The failure of the planted smooth cordgrass (*Spartina alterniflora*) in the southern part of the constructed wetland is likely due to the soil surface being at too low of an elevation. Along brackish northeastern coasts in the United States, smooth cordgrass typically grows in a zone between the mean tide elevation and the mean high tide elevation, in areas that are inundated at least once daily on most days but exposed (not inundated) only during the extreme low tides. The area waterward of mean high tide typically does not support persistent emergent vegetation, even where it is exposed during low tides (the tidal flats). Depending on the tidal range, the elevational difference between the area suitable for smooth cordgrass (the "low marsh") and area too deep (the "tidal flat") may be a fraction of an inch, too small to be perceptible (Thunhorst, 1993; Silberhorn, 1999).

Smooth cordgrass is generally ubiquitous along brackish shorelines in the northeast and will therefore usually colonize unvegetated areas at the appropriate elevation if given sufficient time. Therefore, even if the planted smooth cordgrass specimens at Allen Harbor Landfill had died, smooth cordgrass would likely have colonized in the area of failure if the ground surface elevations were optimal. Five years should be long enough for colonizing to occur, especially considering the abundant seed source in the adjoining area where planted smooth cordgrass has thrived. Therefore, it is believed that the elevation of the failed area is slightly too low to support smooth cordgrass, which is why this area has developed into a tidal flat instead.

In order to replant smooth cordgrass in the subject area, a layer of sand or topsoil would need to be added to raise the ground surface to the elevation where smooth cordgrass is presently growing. This would smother the benthic tidal flat fauna that has developed in the area over the last five years, including both the (sparse) shellfish that were observed and the likely more substantial benthic macronvertebrate and microfauna communities that are present but not casually observable in the wetland. These measures might be warranted if this area was experiencing severe tidal erosion, but it is not due in part to the presence of the breakwater structure. Therefore, replanting of vegetation in the southern portion of the constructed wetland is not recommended at this time.

3.4.4 Issue 4: Recording of Deed and ELUR

The following recommendation was provided in the first five-year review to address the issue of recording the deed and environmental land-use restrictions (ELUR) for Parcel 10: *Work with the Town and National Park Service to expedite property transfer and recording of the deed and ELUR.*

Actions Taken: Parcel 10 was transferred to the Town of North Kingstown via the National Park Service on 10 May 2004 and the ELUR was recorded on 8 June 2004.

3.4.5 Issue 5: Monitoring Well Network Completeness

The following recommendation was provided in the first five-year review to address the issue of monitoring well network completeness: *Assess whether or not to replace damaged monitoring wells and/or consider adding wells to the monitoring network.*

Actions Taken: On 23 May 2007, the Navy performed an assessment of the integrity of the monitoring wells that had been potentially damaged during cap construction activities. The objectives of the assessment were the following:

- Verify the integrity of the six monitoring wells that were labeled "damaged" during well development prior to the first monitoring event. These wells were assumed to be damaged because either the pump used for well development could not be lowered to the bottom of the well, trace amounts of filter sand were observed in well development water, or sand was observed on the pump when it was retrieved from the well.
- Assess the integrity of two wells that are part of the long-term monitoring program (LTMP) network (i.e., wells MW09-09D and MW09-14I), but have not been sampled because of damage

or obstructions that prevented the intake of the sampling pump from being lowered to within the screened interval.

- Assess the integrity of two wells that are not part of the LTMP network (i.e., MW09-17I and MW09-05S), but that could potentially be utilized as replacement or supplemental wells to optimize the LTMP network.

The assessment included an inspection of the overall condition of the well, protective casing, and concrete pad; and the verification of well characteristics such as total depth, construction type, and surface completion. To verify that each well is not pinched or bent below ground, a 5-foot long, 1-3/8 inch diameter slug was lowered to the total depth of each well. The findings of the assessment were presented in a letter report dated 28 June 2007.

The following is a summary of the findings of the assessment:

- In MW09-09D, an obstruction was encountered at approximately 26.5 feet below the top of casing elevation. An attempt was made to dislodge this obstruction, but was met with failure. Therefore, the assessment concluded that this well is damaged and should be replaced.

- In MW09-08S, the 1-3/8 inch slug could not pass an obstruction or bend at approximately 9.2 feet below the well riser. However, a second attempt was made with a 1-inch slug and the total depth of the well was reached.

- In each of the other 10 wells, the 1-3/8 inch slug was able to be lowered to the bottom of the well. A comparison of the present-day elevation of the bottom of each well to the elevation of the original bottom of each well was performed, and indicated that MW09-14I was the only well where a significant difference was observed.

The well integrity assessment concluded that MW09-09D was damaged and should be replaced and that MW09-14I should be re-developed or replaced. After consideration of the risks associated with drilling through landfill materials, the Navy decided that additional efforts to repair MW09-09D and MW09-14I were appropriate before these wells are abandoned and replacements installed.

In December 2007, Navy added four wells and two piezometers to the monitoring network. These new monitoring points include the following:

- Two well couplets along Sanford Road (MW09-26S/D and MW09-27S/D): one couplet on the north end to provide water level and chemistry data at an upgradient location, and a second couplet on the south end to provide water level and chemistry data to help refine the interpretation of groundwater flow patterns in the southwest portion of the landfill,

- A piezometer located between P09-02 and P09-03 in an area identified by EPA as a potential preferential flow pathway, and

- A piezometer between P09-08 and P09-09 at the southern tip of the landfill (TtNUS, 2007o).

The new wells will provide greater resolution for groundwater flow interpretations in the upgradient and southwest portions of the site and monitor the stability of the plume to verify that contaminants are not migrating to the west of the site. The new piezometers will enable additional monitoring of shallow groundwater along the landfill shoreline. Monitoring from these locations began during ME 23 in January/February 2008.

3.5 FIVE-YEAR REVIEW PROCESS

In this section, a description of the five-year review process specific to Allen Harbor Landfill, including the document review, data review, and site inspection is provided. Basewide five-year review items, such as community involvement and interviews, are discussed in Section 1.0.

3.5.1 Document Review

A review of documents relevant to the remedial actions and long-term monitoring activities conducted at Allen Harbor Landfill was undertaken as part of the five-year review. The documents reviewed in order to complete the review included Remedial Investigation reports and risk assessments; the Feasibility Study, Proposed Plan, and Record of Decision; landfill design documents (including pre-design investigations) and as-built drawings; long-term monitoring work plans; long-term monitoring sampling data reports; semi-annual landfill/wetland inspection reports; annual settlement survey reports; and shellfish/well integrity memoranda. For a complete list of documents that were reviewed during preparation of this document, please refer to the Reference section of this report.

During review of landfill O&M documents, it was noted that landfill inspection and maintenance activities are not adequately documented in the record. Based on the review of O&M documents, landfill inspections appear to have been performed only once during 2004 and 2005 and no documentation from landfill settlement surveys was available for 2002 and 2004. Descriptions of landfill maintenance activities completed were not presented in one consistent format, instead they were discussed in a subsequent LTMP data report, landfill inspection report, or some other form of correspondence. Also, based on EPA comments on the Allen Harbor Landfill monitoring reports and discussions at BCT meetings, semi-annual landfill inspection reports and settlement survey reports may not have been distributed to the BCT. While these issues do not impact the protectiveness of the remedy (inspections and surveys of the landfill have been completed frequently enough to verify the effectiveness of the remedy), they do represent opportunities to improve the landfill O&M reporting process in the future.

3.5.2 Data Review

A review of LTM data was performed as part of the five-year review.

3.5.2.1 Groundwater Sampling Data

Twenty rounds of groundwater sampling data were reviewed for Allen Harbor Landfill. During each round of sampling, 18 of the 20 planned monitoring locations were sampled. Two monitoring wells, MW09-09D and MW09-14I, were damaged during cap construction and were not sampled during the first 20 rounds of LTM. Groundwater samples collected from monitoring wells at Allen Harbor Landfill are analyzed for the presence of VOCs, SVOCs, PAHs, pesticides, PCBs, total and dissolved metals, and salinity.

Groundwater sampling results are compared each quarter to project action limits (PALs), which are RIDEM GA Groundwater Objectives (RIDEM, 2004). Table 3-1 is a summary of analytes exceeding PALs in groundwater samples collected from monitoring wells during the first 20 rounds of quarterly monitoring at Allen Harbor Landfill. Table 3-2 provides a summary of the frequency of exceedances (by chemical) in samples collected from monitoring wells during the first 20 rounds of the LTMP. As shown on these tables, VOCs and metals are the only contaminants that have been detected consistently above PALs during the LTMP.

VOCs

Groundwater sampling data collected during the LTMP has confirmed the nature and extent of VOCs in groundwater identified during the Phase II and III RIs completed in 1993 and 1995. In particular, a contaminant plume consisting of chlorinated VOCs remains in the shallow and deep overburden in the southern portion of the landfill, extending beyond the footprint of the landfill to the south and east. Benzene is also present above project action limits in shallow monitoring wells located in the center of the landfill (MW09-07S), southern portion of the landfill (MW09-09S, 20I, and 21S), and northern portion of the landfill (MW09-25S).

In Appendix D, graphs depicting concentration trends for chemicals exceeding PALs in at least 8 of the first 20 monitoring events are presented. In general, the concentrations of VOCs detected in monitoring wells during the LTMP have been steady, despite some significant variability in the data available for certain locations. A statistical analysis was conducted for each of the concentration graphs presented in Appendix D. A summary of the statistical analyses is provided on Table 3-3. The results of the statistical analysis indicate the following statistically-significant (95 percent confidence) trends:

Compound	Well	Trend (95% Confidence)
Benzene	MW09-07S	Decrease
Benzene	MW09-09S	Increase
Vinyl Chloride	MW09-09S	Increase
Tetrachloroethene	MW09-20I	Decrease
Trichloroethene	MW09-20I	Decrease
1,1-Dichoroethene	MW09-20I	Decrease
Vinyl Chloride	MW09-20D	Increase
Benzene	MW09-21S	Decrease
Vinyl Chloride	MW09-21D	Increase

The following contaminants exhibited concentration trends with an 80 percent confidence level:

Compound	Well	Trend (80% Confidence)
cis-1,2-DCE	MW09-03D	Decrease
Vinyl chloride	MW09-08S	Decrease
cis-1,2-DCE	MW09-09S	Increase
Trichloroethene	MW09-21D	Decrease
cis-1,2-DCE	MW09-21D	Decrease

All other trends for VOCs in monitoring wells were not significantly different than zero.

The groundwater analytical data indicate that groundwater continues to pose unacceptable risk to human health if used for drinking or if used for showering, however the groundwater use restriction for Parcel 10 prohibits such exposures.

Metals

The only metal to have exceeded its PAL in more than 5 of the 20 monitoring events completed to date is arsenic. Arsenic is present above PALs in shallow groundwater in wells located in the central (MW09-07S), southern (MW09-08S and 20I), and eastern (MW09-10S and 23S) portions of the landfill. MW09-24D is the only deep monitoring well with arsenic consistently above PALs. As shown on the graphs presented in Appendix D, and in the statistical analysis of concentration trends for arsenic, concentrations of arsenic in monitoring wells at the landfill are steady if not decreasing since the inception of the LTMP.

The only statistically-significant trend identified for arsenic concentrations in monitoring wells was a decreasing trend for arsenic in MW09-23S.

3.5.2.2 Piezometers

A network of 10 piezometers is used to monitor contaminants in shallow groundwater at the perimeter of Allen Harbor Landfill. Piezometers are installed to a depth of 3 feet below the sediment surface at the base of the landfill revetment. The screened interval of the piezometers is 2 to 3 feet below the sediment surface. Groundwater samples are collected from piezometers every quarter and analyzed for the presence of VOCs, SVOCs, PAH, pesticides, PCBs, total and dissolved metals, and salinity.

Piezometer sampling results are compared each quarter to PALs, which are the Marine Chronic Criteria from the U.S. EPA National Recommended Water Quality Criteria (EPA, 2002), with the exception of copper, mercury, and nickel for which site-specific PALs were developed as part of the *Site 09 Shoreline Risk Monitoring and Remediation Goal Values for Protection of Aquatic, Terrestrial, and Human Exposure Pathways* (NewFields, 2000c). Table 3-4 is a summary of analytes exceeding PALs during the first 20 rounds of quarterly monitoring at Allen Harbor Landfill. There are no PALs for VOCs detected in piezometers at Allen Harbor Landfill, however this table includes a summary of TCE, total 1,2-DCE, and vinyl chloride detected in P09-06, P09-08, and P09-10 during the LTMP. Table 3-5 provides a summary of the frequency of exceedances by chemical in piezometers during the first 20 rounds of the LTMP.

<u>Metals</u>

As shown on Table 3-5, the contaminants most frequently present in piezometers at levels above PALs are metals. In most cases, the concentrations of metals detected in piezometers were highest during the first four monitoring events. Since ME 10 (March 2004), the number of PAL exceedances has decreased significantly and nickel is the metal that has exceeded its PAL most frequently.

<u>VOCs</u>

In general, CVOCs have not been detected in piezometers during the LTMP except for the following:

- CVOCs have been detected in P09-08 during each monitoring event since September 2002. In March 2004 (ME 10), the concentrations of CVOCs detected in P09-08 increased considerably, and have since fluctuated on a seasonal basis between approximately 1,800 μg/L (total CVOCs) during the spring and 200 μg/L during the fall.

- CVOCs have been detected in P09-10 during each monitoring event since June 2002.

- CVOCs were detected in P09-06 during the September 2002 and January 2003 monitoring events. The CVOC concentrations present in P09-06 during January 2003 were unusually high for this location and have not been replicated since.

- CVOCs were detected twice in P09-09 and four times in P09-07 at low concentrations.

- CVOCs were detected only once in P09-02, P09-03, and P09-05, each time at low concentrations.

A statistical analysis of concentration trends was performed for the VOCs most frequently detected in P09-08 and P09-10 (vinyl chloride and total 1,2-DCE). The results of the analysis indicate there have been no 95 percent statistically-significant trends in contaminant levels, however the concentrations of 1,2-DCE in P09-08 have increased with greater than 90 percent confidence and the concentration of vinyl chloride in P09-10 has decreased with approximately 80 percent confidence during the LTMP.

The most significant observation from the review of analytical results from piezometer samples is the increase in CVOCs (particularly vinyl chloride and 1,2-DCE) in P09-08. This contamination is likely an extension of the groundwater plume that is, and has been, present in the southern portion of the landfill near MW09-20I (and former MW09-20S). Although the LTMP data suggest that this contamination emerged in shallow groundwater along the landfill shoreline during the March 2004 monitoring event, the RI indicated the CVOC plume extended beyond the footprint of the landfill and this was verified during the 1997 Off-Shore Investigation conducted prior to the remedy (EA, 1998c).

Coincident with the initial detection of elevated CVOC concentrations in P09-08 during March 2004 was a significant decrease in the concentrations of metals detected in groundwater samples collected from most piezometers. The sharp decrease in metals detected in piezometer samples was most pronounced in piezometers located within the constructed wetland.

3.5.2.3 Sediment

Sediment samples are collected from the landfill shoreline at each of the ten piezometer locations. Sediment samples are analyzed for the presence of VOCs, SVOCs, PAH, pesticides, PCBs, metals, percent solids, and total organic carbon.

Sediment sampling results are compared each quarter to PALs, which are the Effect Range Median, September 1999, with the exception of 4,4'-DDE, Total Aroclor, and zinc, for which site-specific PALs were developed as part of the *Site 09 Shoreline Risk Monitoring and Remediation Goal Values for Protection of Aquatic, Terrestrial, and Human Exposure Pathways* (NewFields, 2000c). Table 3-6 is a summary of analytes exceeding PALs in sediment samples collected during the first 20 rounds of quarterly monitoring at Allen Harbor Landfill. There are no PALs for VOCs detected in sediment samples at Allen Harbor Landfill because there were no unacceptable risks associated with exposure to VOCs in sediment. Table 3-7 provides a summary of the frequency of exceedances by chemical in sediment samples collected during the first 20 rounds of the LTMP.

As shown in Table 3-7, exceedances of PALs in sediment samples have been infrequent. Several PAHs have exceeded PALs in SED09-09 and SED09-10 one or two times during the LTMP. Three pesticides have exceeded PALs in sediment samples, the most frequent being 4,4'-DDE which has exceeded its PAL at one location (SED09-09) four times during the LTMP.

The only consistent exceedance of PALs in sediment samples collected from the landfill shoreline is the concentration of PCBs detected in SED09-01. SED09-01 is located within the PCB removal area that was encountered during construction of the remedy and resulted in an ESD. The concentrations of Total Aroclors detected in sediment samples from this area have exceeded the PAL of 215 µg/kg in 11 of the 20 monitoring events completed to date. Only one time, however, has the concentration of Total Aroclors exceeded 1,000 µg/kg, which was the cleanup goal that was established for the removal of PCB-contaminated soils and sediment during the remedial action.

Although there are no PALs for VOCs in sediment (since there were no unacceptable risks identified for VOCs in sediment), a summary of VOC sampling results is presented in this section to evaluate whether sediments in the near-shore area are being contaminated by landfill constituents. Several VOCs such as acetone, chloromethane, 2-butanone, and carbon disulfide have been detected in sediment samples during the course of the LTMP. These constituents are generally not believed to have migrated into shoreline sediments from the landfill since they have been detected infrequently (if at all) in groundwater samples collected from monitoring wells at Site 09. More likely they are remnants from the historical use of the site as a landfill.

Only limited evidence of the chlorinated VOCs present in groundwater at Allen Harbor Landfill has been observed in sediment samples collected during the LTMP. Vinyl chloride and TCE have been detected in SED09-08, which is downgradient from the MW09-20 location and collocated with P09-08. Vinyl chloride was detected in sediment at this location in 2 out of 20 sampling rounds (June 2004 and March 2006). In March 2006, TCE was also detected in the sediment sample from this location. Each detection was at a level slightly above (or below) the detection limit (maximum concentration = 2 μg/kg). Detections of vinyl chloride of the same magnitude were observed in SED09-10 during December 2003 and March 2005 (maximum concentration = 1 μg/kg). Vinyl chloride and TCE have not been detected in any other LTMP sediment samples.

3.5.2.4 Landfill Gas

Landfill gas samples are collected from five passive landfill gas vents located in the center of the landfill during each monitoring event. Landfill gas samples are analyzed for the presence of VOCs, SVOCs, total petroleum hydrocarbons (TPH), and methane. Analytical results from the analysis of landfill gas samples (volume basis) are converted to mass flow rate using the density of each gas and the air flow rate measured during sampling, then compared to PALs. No exceedances of PALs have been observed for any contaminant in any vent during the first 22 rounds of the LTMP.

3.5.2.5 Shellfish

During December 2007, the Navy collected shellfish samples from the landfill shoreline in the P09-01, P09-09, and P09-10 areas. This was the first shellfish sampling round conducted since the inception of the LTMP. Two samples of ribbed mussels were collected from the P09-01 area and two samples were collected from the P09-09/10 area. In addition, reference samples were collected from Fishing Cove in Wickford, Rhode Island and from the shoreline of Prudence Island, located in Narragansett Bay, to evaluate the anthropogenic background levels of contamination present in similar marshy areas within or adjacent to Narragansett Bay. Shellfish samples were analyzed for SVOCs, PAHs, pesticides, PCB homologs, metals, and percent lipids.

There are no PALs for shellfish samples collected from the shoreline of Allen Harbor Landfill, therefore on-site shellfish sampling results were compared to the results of the two reference samples. Where concentrations levels in the on-site shellfish samples exceeded those of the reference samples, sampling results were compared to data collected from similar locations during the RI in 1995. The shellfish data collected during 2007 indicate that SVOCs, pesticides, and metals are present in ribbed mussels at levels comparable to the two reference stations utilized for this study. The concentrations of PAHs and PCBs detected in the on-site shellfish samples are either within the same range as the reference samples or exceeded the levels detected in the reference samples. For PAHs and PCBs, a comparison of 2007 sampling results to ribbed mussel sampling results collected during the marine ecological risk assessment from the same areas of the site indicate that these chemicals are present at lower concentrations now than they were in the mid-1990s prior to the completion of the remedy.

3.5.2.6 Annual Landfill Settlement Surveys

Landfill settlement surveys are completed annually from 22 monitoring wells, 5 gas vents, and 6 locations each on the revetment wall, breakwater structure, and constructed wetland. The objective of the annual survey is to monitor changes in elevation at various locations throughout the landfill and evaluate whether they are significant enough to warrant concern that the integrity of the remedy is at risk. The Final *Remedial Action Operations and Long-Term Management Plan for Allen Harbor Landfill* established a benchmark of 6 inches of differential settlement over 100 linear feet for the purpose of identifying potential areas of excessive settlement. Based on the evaluation of survey data collected since 1999, there are no areas on the landfill cap that exceed this benchmark, indicating that the integrity of the landfill liner is not likely to have been impacted by differential settlement. A summary of landfill settlement survey data collected during the LTMP is provided in Appendix E.

3.5.2.7 Summary of Data Review

The data collected to date during the LTMP support the conclusions of the RI/FS that formed the basis for the ROD signed in 1997 by the Navy and EPA, and concurred with by RIDEM. The long-term monitoring data indicate that groundwater would continue to pose an unacceptable risk to human health if used for drinking or showering. Shallow groundwater data from the shoreline piezometers indicate that the VOC plume in shallow groundwater at the site extends into the off-shore area to the south of the landfill, but that groundwater does not transport significant concentrations of landfill constituents into near-shore sediments. The analysis of landfill gas samples indicates that VOCs, SVOCs, petroleum hydrocarbons, and methane are being released from the landfill at rates that are well below state criteria.

3.5.3 <u>Site Inspection</u>

This section summarizes routine LTMP site inspection activities and the site inspection performed specifically for this five-year review.

3.5.3.1 LTMP Site Inspections

Site inspections are conducted quarterly at Allen Harbor Landfill in conjunction with each long-term monitoring event. During the inspection, each monitoring well is checked to ensure that it is locked, labeled, and in good condition. Observations are noted on a monitoring well inspection form that is included in Appendix A of the long-term monitoring results reports. The site inspection also includes an on-site verification of the effectiveness of land-use controls by observing land use conditions (presence of buildings and level of recreational use at the site) and evidence of groundwater extraction wells.

Review of site inspection forms completed during the LTMP indicates that all wells are locked and properly labeled. Land-use control inspections performed during the LTMP have not detected any evidence of water supply wells or new construction at the site (EA, 2002c, 2003a, 2004e; TtNUS, 2006b, 2006c, 2007h).

3.5.3.2 TtNUS Site Inspection

TtNUS performed a site inspection on 24 August 2007. The inspection included a site walkover and a review of documents at the North Kingstown Free Library. Photographs from the site inspection are included in Appendix C.

The site inspection began at the southwestern corner of the landfill near the south drainage swale. TtNUS proceeded along the exterior perimeter of the landfill. Groundwater monitoring wells and passive landfill gas vents were inspected as they were encountered.

The inspection team observed that the stone drainage channel located at the southeastern corner of the landfill had a moderate amount of vegetation growing on its surface (this vegetation was removed during landfill maintenance activities completed in November 2007). The inspection proceeded along the southern stone revetment. The landfill cap appeared well vegetated with healthy grass. Small trees were observed growing on the landfill outside the multimedia cap area. Slight vehicle ruts were observed along the southern landfill perimeter. The ruts were reportedly caused by contractors using vehicles during long-term monitoring events (these ruts were filled in with gravel during landfill maintenance activities in November 2007).

All monitoring wells observed appeared to be in good condition and were locked. Gas vents were secured by a locked chain-link fence enclosure.

The constructed inter-tidal wetland area located along the base of the eastern perimeter of the landfill was observed. The stone breakwater located outside the wetland area appeared in good condition. Wetland vegetation appeared to be healthy. Warning signs were observed in the wetland area. The signs indicated the area was a "Polluted Area" and that the taking of shellfish was prohibited by RIDEM. The post on one of the signs was damaged such that the sign was leaning toward the landfill (this sign was repaired during December 2007 by stabilizing the damaged post with grade stakes and the sign now standing upright). The stone revetment along the eastern perimeter of the landfill was in good condition with no vegetation growing on its surface.

Vegetation was noted on the surface of the stone drainage channel located at the north perimeter of the landfill (this vegetation was removed during landfill maintenance activities in December 2007). In addition, assorted debris, possible washed by storm waves, was also present on its surface.

Many of the rails on the wooden fence located along the western perimeter of the landfill were in disrepair. Broken or rotted fence rails were replaced during landfill maintenance activities in November 2007. Vehicle ruts and erosion was observed on the access road located near the western entrance of the landfill (a 6-inch layer of gravel was placed over the entrance ramp during landfill maintenance activities in November 2007).

The Town of North Kingstown Park Rules and Regulations sign was observed adjacent to monitoring well location MW09-02S/03D near the western entrance to the landfill. The sign was in good condition and clearly visible from Sanford Road.

3.6 TECHNICAL ASSESSMENT

3.6.1 Question A: Is the remedy functioning as intended by the decision documents?

The review of long-term monitoring data, risk assumptions, site inspections, land-use control inspections, and ARARs indicates that the remedy is functioning as intended by the ROD. The evaluation presented in this section includes a discussion of the performance of the remedy versus the objectives stated in the ROD.

Surface Soil. The remedial action objectives for surface soil stated in the ROD include a) the prevention of human and terrestrial animal exposure to contaminants in surface soil and b) the prevention of offsite migration of surface soil and surface soil constituents through overland runoff. The remedial actions taken to address these objectives were the construction of the RCRA cap and soil cap over the landfill surface and the construction of the shoreline revetment. These actions prevent exposure to surface soils by human and terrestrial ecological receptors and prevent erosion of landfill materials into the shoreline environment, respectively. These site features are inspected by the Navy semi-annually, as required by the ROD, to ensure their continued integrity and effectiveness. While minor issues such as surface rutting and intrusive vegetation have been identified during inspections, they have been remedied and have not impacted the integrity of the landfill cap, drainage swales, or revetment.

Subsurface Soil. The remedial action objectives for subsurface soil stated in the ROD include a) reduction in leachate generation and b) reduction or elimination in surface erosion and exposure of fill materials along landfill shoreline.

The evaluation of water level data collected during the LTMP suggests that the cap is impeding the infiltration of rainwater through the unsaturated zone, which reduces the generation of leachate. A qualitative comparison of on-site groundwater levels to those observed at the nearest USGS monitoring well (Appendix F) suggests water levels in monitoring wells located outside of the capped area (i.e. MW09-02S, MW09-24S, and MW09-25S) correlate more closely to the off-site well than water levels measured in wells located within the capped area, indicating that water levels within the cap respond differently to seasonal variations in precipitation than wells located beyond the limits of the cap. These data, along with the evaluation of landfill survey data that suggests the integrity of the cap is intact, provide evidence to support a reduction in leachate generation since construction of the remedy.

Erosion of and exposure to fill materials located along the landfill shoreline has been mitigated by the removal of debris and construction of the stone revetment. Semi-annual inspections of the revetment have indicated only minor displacement of stones, occasional vegetative growth (which has been removed), and minimal erosion at the toe of the slope presumably resulting from a concentrated runoff from the edge of the landfill cap. None of these issues has negatively impacted the integrity or effectiveness of the revetment.

Groundwater. The remedial action objective for groundwater stated in the ROD was to prevent human exposure to contaminants in deep groundwater. The Navy has performed land-use control inspections at least annually at Allen Harbor Landfill to verify that no water supply wells are constructed on the site. Based on the findings of these inspections, there is no exposure to contaminated groundwater.

Sediment. The remedial action objectives for sediment stated in the ROD include a) minimizing risks from marine ecological exposure to contaminants in sediment and b) controlling potential future sediment contamination from landfill constituents. To evaluate risks along the shoreline associated with site contamination, sediment sampling results are compared against the site-specific Shoreline Risk Monitoring and Remediation Goal (RG) Values that were developed for the protection of aquatic, terrestrial, and human health exposure pathways. Site-specific RG Values were developed for zinc, Total Aroclors, and 4,4'-DDE based on the conclusions of a harbor-wide study presented in a report titled *Preliminary Remediation Goals (PRGs) for NCBC Allen Harbor Landfill (Site 09)* (SAIC, 1998). These site-specific values, together with Effect Range Median values (September 1999), represent the PALs for sediment along the Allen Harbor Landfill shoreline.

The evaluation of long-term monitoring data collected during the first 20 rounds of quarterly monitoring indicates exceedances of PALs in sediment samples are infrequent, with the exception of PCBs in SED09-01 (Tables 3-6 and 3-7), indicating remedial actions along the shoreline (i.e. sediment removal and wetland construction) have reduced contaminant levels below PALs and sediments are not being re-contaminated by landfill constituents.

Wetlands. The remedial action objectives for wetlands stated in the ROD include a) controlling potential future contamination of wetlands from landfill constituents and b) improving the quality of existing wetlands and creating new wetlands along the landfill shoreline.

The evaluation of piezometer and sediment sampling data indicates that, in general, the remedial action is controlling the migration of landfill contaminants into the wetlands. Elevated concentrations of CVOCs are present in P09-08 but contaminant levels have not increased since first detected in March 2004. Exceedances of PALs in sediment samples collected from the constructed wetland (SED09-02 through SED09-08) are infrequent, as shown in Tables 3-6 and 3-7.

Wetland inspections have been conducted semi-annually as part of the LTMP for Allen Harbor Landfill. Inspections include an evaluation of the enhanced wetland areas located to the north of the site and the constructed wetland located to the east of the landfill. With few exceptions, these wetland areas are populated with abundant vegetation and are minimally impacted by invasive species. Areas devoid of vegetation located in the central and southern portions of the constructed wetland are likely due to the tidal range elevation of the substrate rather than stresses related to landfill constituents (see Section 3.4.3). The point at which the smooth cordgrass stops appears to reflect the point where the sediment surface elevation becomes too low to support the plant. This pattern simulates the transition from smooth cordgrass vegetation (low marsh vegetation) to unvegetated tidal flat in natural tidal marshes. Invasive species are present in the landward portions of the enhanced wetlands, but their abundance decreases considerably as one moves toward the water where smooth cordgrass dominates then unvegetated tidal flat is present.

During a recent wetland inspection, several ospreys (*Pandion haliaetus*) and double-crested cormorants (*Phalacrocorax auritus*) were observed on poles near the constructed wetland. Two American egrets (*Casmerodius albus*) were observed in the natural marsh south of the constructed wetland. A belted kingfisher (*Megaceryle alcyon*) was observed on a pole near the enhanced wetland. All are predators of fish and/or shellfish and appear to be benefiting from the food sources provided by Allen Harbor, the constructed wetland, the enhanced wetland, and other tidal marshes fringing Allen Harbor (TtNUS, 2007p).

Shellfish. The remedial action objectives for shellfish stated in the ROD include a) controlling potential future contamination of shellfish from landfill constituents and b) preventing or minimizing human ingestion of shellfish from the landfill shoreline containing site-related contaminants above health advisory concentrations.

The comparison of shellfish sampling data collected during December 2007 to reference sample results and data (from the same species) collected during the RI in 1995 from similar locations indicates that the remedy is controlling contamination of shellfish from landfill constituents. There are three signs present along the landfill shoreline notifying trespassers and the public of the state-imposed shellfishing ban that is in place for Allen Harbor. All three signs are in good condition.

3.6.2 Question B. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Changes in Standards and TBCs: ARARs and TBCs considered during preparation of the ROD were reviewed to determine changes in standards since the last five-year review. There have been no changes to currently relevant ARARs with the exception of monitoring criteria.

According to the ROD for Allen Harbor Landfill, long-term monitoring of groundwater, sediment, landfill gas, and shellfish quality were to be performed to evaluate the protectiveness of the remedy. Sampling results are compared to project action limits which were established to evaluate protectiveness. These are discussed in the following paragraphs.

- Groundwater quality was to be monitored using USEPA Safe Drinking Water Act (SDWA) Maximum Contaminant Levels (MCLs) and State Groundwater Quality Standards listed in Table 1 of RIDEM's Rules and Regulations for Groundwater Quality. The current USEPA MCLs are presented in EPA's Drinking Water and Health Advisory Table (USEPA, Summer 2006) and the State Groundwater Quality Standards were updated in March 2005. The groundwater monitoring criteria were presented in Table 8-2A of the *QAPP for the Long Term Monitoring Plan for Site 09* (EA, 2001b and 2003b). A comparison of the old and current groundwater monitoring criteria indicates that there have been no changes in the groundwater monitoring criteria for Site 09 since the last review (Table 3-8).

- Sediment quality was to be monitored using site-specific RGs and the ecological Effects Range Median (ERM) values determined by Long et al. and published in 1995 (Environmental Management, Volume 19, 1995). The sediment monitoring criteria were presented in Table 8-2B of the *QAPP for the Long Term Monitoring Plan for Site 09* (EA, 2001b and 2003b). The ERM values have not been changed since 1995 and, therefore, the protectiveness of the remedy for sediment has not been impacted.

- Landfill gas was to be monitored using chemical-specific RIDEM Allowable Emission Rates. The landfill gas monitoring criteria were presented in Table 8-2D of the *QAPP for the Long Term Monitoring Plan for Site 09* (EA, 2001b and 2003b). RIDEM air toxics emissions rates were updated in July 2007 and are presented in RIDEM's Air Pollution Control Regulation No. 22. The values for some chemicals may have changed, therefore it may be necessary to update Table 8-2D of the *QAPP for Long-Term Monitoring.*

- Table 8-2C of the *QAPP for the Long Term Monitoring Plan for Site 09* (EA, 2001b and 2003b) lists chemicals to be monitored in shellfish. No PALs for shellfish are provided in the table. Future evaluations of shellfish sampling data will include the comparison of multiple rounds of data to identify concentration trends.

Changes in Exposure Pathways: Since the construction of the multimedia cap, and based on the review of the long-term monitoring data, there have been no changes at the site that would have resulted in new exposure pathways to human or ecological receptors.

Changes in Toxicity and Other Contaminant Characteristics: There have been no changes in human health toxicity criteria that would impact the monitoring criteria. The toxicity factors (i.e., CSFs and RfDs) used in the human health risk assessment for Site 09 were obtained primarily from IRIS or other sources (e.g., HEAST) in 1995. The toxicity factors for some contaminants of concern at Site 09 have changed since that time. The most noticeable of these are beryllium; 1,1-DCE; PCE, TCE; and PCBs; and the inhalation RfD for naphthalene.

- Beryllium and 1,1-DCE are no longer classified as carcinogens for the oral route of exposure by the USEPA. Therefore, the risks calculated for these chemicals today would be significantly less than the risks calculated in the risk assessment.

- The CSFs currently recommend by the USEPA for PCE and TCE have increased by an order of magnitude or more since 1995 and, therefore, the risks calculated for these COCs would increase. However, these changes would not alter the results and conclusions of the risk assessment and do not affect the values of the monitoring criteria or the protectiveness of the remedy.

- The CSF for PCBs used in the risk assessment is approximately 4 times greater than the value currently used. Therefore, the risks calculated for PCBs in soil, sediment, surface water, and shellfish in the risk assessment may be overestimated. However, the risks calculated for PCBs in soil, sediment, and surface water were 1E-6 or less and risks for shellfish were greater than 1E-3.

Therefore, the results of the risk assessment would not be significantly affected by use of the current CSF for PCBs.

- The current inhalation RfD for naphthalene is more conservative than the value used in the risk assessment, thus the risks for construction workers may be underestimated by approximately two orders of magnitude. However, the Hazard Quotient (HQ) for inhalation of naphthalene was 0.00001 and would still be well below the USEPA acceptable level of one, if the current RfD value were used.

A comparison of toxicity criteria values from the RI to current toxicity values is provided on Table G-3 of Appendix G. A comparison of exposure factors used in the Site 09 risk assessment with currently used values is provided on Table G-4 of Appendix G.

Changes in Screening Criteria: When the risk assessment for Site 09 was conducted in 1996, the 1995 USEPA Region 3 RBCs were used as the basis of the COPC screening criteria, in accordance with Region I policy. In 1999, Region I recommended that the Region 9 PRGs be used for screening instead of the Region 3 RBCs. Some Region 9 PRGs are based on different exposure assumptions and are generally lower than the Region 3 RBCs. For example, the Region 3 RBCs for soil are based on ingestion route of exposure only, but the Region 9 PRGs are based on the combined effects of ingestion, dermal contact, and inhalation routes of exposure. Consequently, the differences in the values of RBCs and PRGs can be significant. For example, the industrial RBC for naphthalene used in the risk assessment for Site 09 was 82,000 mg/kg but the current Region 9 PRG for industrial soil is 190 mg/kg. If the Region 9 PRGs were used for soil screening at Allen Harbor Landfill, naphthalene would be selected as a COPC for surface soil and total soils. However, its exclusion as a COPC is not expected to impact the protectiveness of the remedy. A comparison of old versus new screening criteria values is provided on Tables G-9 through G-12 of Appendix G.

Changes in Risk Assessment Methods: There have been several changes in HHRA methodology since the Phase III report was finalized in 1998. These changes in themselves would not impact the results of the risk assessment or the protectiveness of the remedy. Among these are:

- The implementation of the USEPA's Dermal Guidance (RAGS-Part E) which was finalized in July 2004 (http://www.epa.gov/oswer/riskassessment/ragse/index.htm). The risk assessment for Site 09 evaluated risks for dermal contact with soil, sediment, surface water, and groundwater. Based on several USEPA guidance documents published in 1993 and 1994, risks for dermal contact with carcinogenic PAHs were not evaluated in the risk assessment. Dermal contact with arsenic in soil and sediment was also not evaluated in the risk assessment. The 2004 dermal guidance recommends evaluation of PAHs and arsenic and this could impact risks for construction workers in soil and risks for recreational users in soil and sediment. If the risks for construction workers were reevaluated including dermal contact with carcinogenic PAHs and arsenic in soil, total risks for soil would increase from 2E-6 to approximately 3E-6 for the RME case. The risks for recreational exposure to soil would increase from 4E-5 to 5E-5 and risks for sediment would increase from 1E-5 to 1.5 E-5, if dermal contact were included. These calculations indicate that the results and conclusions of the risk assessment for Site 09 have not been significantly affected by omitting the dermal evaluation of PAHs and arsenic.

Use of the RAGS-Part E guidance would also result in slight changes in some dermal exposure parameters, such as exposed skin surface areas and dermal absorption factors. However, the affect of these changes on the calculated risks would be minimal and would not affect the results and conclusions of the risk assessment for Site 09.

- Calculation of exposure point concentrations (EPCs). EPCs for soil, sediment, and shellfish in the Phase III Human Health Risk Assessment for Site 09 were determined according to the Supplemental Guidance to RAGs: Calculating the Concentration Term (USEPA, May 1992). Using this guidance, risks for the reasonable maximum exposure (RME) were calculated using either the maximum detected concentration or the 95 percent UCL based on a lognormal distribution. New guidance for estimating EPCs was published in the USEPA's *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites* (USEPA, December 2002) (http://www.epa.gov/oswer/riskassessment/pdf/ucl.pdf) and the ProUCL guidance (USEPA, April 2007) (http://www.epa.gov/nerlesd1/tsc/software.htm). The effects of using the new guidance on the Site 09 data are not known. However, because risks for the RME were based on maximum detected concentrations or lognormal 95 percent UCLs, it is unlikely that soil risks were underestimated by using the 1992 guidance.

- Carcinogens that Act by a Mutagenic Mode of Action. In March 2005, the USEPA provided general direction on implementing the USEPA's 2005 *Guidelines for Carcinogen Risk Assessment (http://www.epa.gov/ncea/iris/cancer032505-final.pdf) and Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens* (http://www.epa.gov/ncea/iris/children032505.pdf) because of special considerations for carcinogens that act via a mutagenic mode of action (e.g., vinyl chloride and PAHs). This guidance mainly affects risks calculated for children, adolescents, and lifelong residential risks. For Site 09, this could potentially affect risks calculated for residential exposure to vinyl chloride in groundwater, risks for recreational exposure to soil and sediment (by adolescents), and risks for the ingestion of shellfish containing PAHs. The risks calculated for hypothetical residents assumed to be exposed to vinyl chloride in groundwater in the Phase III risk assessment exceeded 1E-2. If the new guidance were used, this risk would increase slightly but the results and conclusions of the risk assessment and the remedy for the site would not change. If the new guidance were used to estimate risks for carcinogenic PAHs, the changes in total risk estimates for the media evaluated would be as follows:

- Construction worker exposure to soil – no change
- Recreational exposure to soil – total risk increases from 4E-5 to approximately 8E-5.
- Recreational exposure to sediment – total risk increases from 1E-5 to approximately 4E-5
- Ingestion of shellfish – total risk increases from 2E-3 to approximately 3E-3

As shown above, use of the new guidance for PAHs would result in a slight increase in total risks but would not impact the results and conclusions of the risk assessment and the remedy for the site would not change.

Combined Effects of Changes: As discussed above, the individual changes in risk assessment methodology and toxicological data would not, in themselves, affect the results and conclusions of the risk assessment and the remedy for Site 09. However, the cumulative effects of these changes might result in unacceptable risks for some exposure scenarios. A discussion of the potential cumulative effects in presented below (note the discussion below pertains to risks calculated prior to implementation of the remedy).

- **Residential Exposure to Groundwater.** The RME cancer risk for groundwater was 3E-1 prior to the remedy. Changes in risk assessment methodology would not significantly affect risk estimates for groundwater. The monitoring criteria for groundwater are USEPA MCLs, which are not risk-based values, and these have not changed. Therefore, the protectiveness of the remedy for groundwater at Site 09 would not be affected by the changes in methodology.

- **Ingestion of Shellfish.** The RME cancer risk for the ingestion of shellfish was 2E-3 prior to the remedy. Changes in risk assessment methodology would not significantly affect these risks.

- **Remediation/Contruction Worker Exposure to Soil.** The RME cancer risk for the construction worker was 2E-6 prior to the remedy. Changes in risk assessment methodology would not significantly affect these risks.

- **Recreational Exposure to Surface Soil.** The RME cancer risk for surface soil was 4E-5 prior to the remedy. If the cumulative effects of changes in risk assessment methodology and toxicology were taken into account, the total risk might exceed 1E-4. However, the remedy included placement of a soil cap/cover over surface soils, preventing exposure, therefore these changes would not significantly impact the protectiveness of the remedy.

- **Recreational Exposure to Surface Water.** Changes in risk assessment methodology would not significantly affect risks for surface water.

- **Recreational Exposure to Sediment.** The RME cancer risk for sediment was 1E-5 prior to the remedy. Risks would increase if the cumulative effects of changes in risk assessment methodology and toxicology were taken into account, but the total risk would likely be less than 1E-4. A more rigorous risk analysis would be necessary to evaluate the cumulative effects of the changes, however the remedy included remediation of sediment and LTMP data indicate that contaminant levels in sediment are protective to both human and ecological receptors, therefore these changes would not significantly impact the protectiveness of the remedy. Further discussion, and a table comparing LTMP sediment data to risk-based concentrations for exposure to sediments, has been included in Appendix G.

Note that the above discussion focused on cancer risks because cancer risks would be most affected by the abovementioned changes. Noncarcinogenic risks would not be as greatly affected because the most significant changes were associated with HHRA methodology for the carcinogenic PAHs.

Supporting risk assessment tables and calculations for the analysis presented in this section are found in Appendix G (Risk Assessment Support Documentation).

3.6.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No weather-related events have affected the protectiveness of the remedy and there is no other information that calls into question the protectiveness of the remedy.

3.6.4 Technical Assessment Summary

Based on the LTM data reviewed and land-use control inspections, the remedy at Allen Harbor Landfill is functioning as intended by the ROD. Regular monitoring is occurring from groundwater, sediment, and landfill gas at the locations where exposures to these media are most likely to occur. Shellfish sampling along the landfill shoreline commenced in 2007. Landfill inspections are being performed and documented to verify the integrity of the landfill cap, monitoring wells, gas vents, revetment, wetlands, breakwater, and other remedy features.

Land-use restrictions are effectively preventing exposure to groundwater contaminated with VOCs, SVOCs, and metals. The landfill cap components prevent contact with contaminants in surface and subsurface soils. Sediment sampling data indicates that contaminant levels in sediment are within acceptable ranges and are not being re-contaminated by landfill constituents. Landfill gas sampling data indicates that emission rates from gas vents are within acceptable ranges. Shellfish sampling data indicate the remedy is controlling the contamination of shellfish by landfill constituents.

There have been no changes in physical conditions at the landfill that would affect the protectiveness of the remedy. There have been no changes to ARARs or TBC guidance that would impact the protectiveness of the remedy. However, the RIDEM Allowable Emissions Rates used to evaluate gas vent emissions may need to be adjusted to reflect recent changes to RIDEM Air Resource Regulations.

Minor changes in risk assessment methods and the toxicity of contaminants that have occurred since the last review are not expected to adversely impact the remedy. For certain exposure scenarios (recreational exposure to surface soils and sediment), the calculated total risk associated with exposure to contaminants may have increased above 10E-4 using current risk assessment methods, however the remedial actions taken at the site have addressed these exposures and they do not present a protectiveness concern.

No other information has come to light that could call into question the protectiveness of the remedy.

Statistically-significant (95 percent confidence) increasing concentrations of VOCs have been observed in MW09-09S, MW09-20D, and MW09-21D over the course of the LTMP. These increases are likely due to the vertical or horizontal migration of contaminants within the landfill. Presently, the increase in VOC concentrations in these wells does not present a protectiveness issue since the use of on-site groundwater is prohibited by the land-use restrictions. Additional sampling and trend analysis will be utilized in the future to monitor changes in VOC concentrations in these and other on-site wells to evaluate potential risks associated with groundwater contamination.

Elevated concentrations of CVOCs have been present in shallow groundwater samples collected from piezometer location P09-08 since March 2004, although CVOC contamination was known to exist beyond the landfill shoreline as early as 1997 (EA, 1998c). The reason for the sudden detection of CVOCs in P09-08 during the sixth monitoring event is not clear, however it roughly corresponds with a similar increase in CVOCs detected in piezometers at Calf Pasture Point and the institution of modified shoreline piezometer sampling procedures that were recommended in the first five-year review (the first five-year review questioned the representativeness of samples collected from shoreline piezometers). Nevertheless, further study to delineate the extent of CVOCs in groundwater beneath the Harbor may be appropriate if CVOC concentrations increase from their current levels and unacceptable risks are suspected.

3.7 ISSUES

Issue	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
1. LTM program needs to be reviewed/updated.	N	Y
2. Landfill maintenance activities not communicated effectively to BCT.	N	N
3. Risk communication to community.	N	N

3.8 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Issue	Recommendations/Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1.	a) Schedule a DQO meeting to discuss optimization of the LTMP and establish the objectives and scope of the LTMP. b) Prepare a revised Work Plan/SAP for Long-Term Monitoring at Site 09.	Navy	EPA/ RIDEM	7/1/08 11/30/08	N	Y
2.	a) Include a section in quarterly monitoring reports or annual monitoring reports detailing landfill maintenance activities completed. b) Maintain a regular inspection schedule and provide draft landfill inspection reports to the BCT within one month of inspections.	Navy	EPA/ RIDEM	4/1/08 4/1/08	N	N
3.	Develop fact sheet for Site 09 providing information to the public in laymen's terms regarding risks associated with planned activities and uses for Allen Harbor Landfill.	Navy	EPA/ RIDEM	6/1/08	N	N

3.9 PROTECTIVENESS STATEMENT

The remedy at Allen Harbor Landfill is currently protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being addressed through remedy-related institutional controls and a state-enforced prohibition on shellfishing in Allen Harbor. These controls are effectively preventing exposure to site-related contaminants.

In order to verify that the remedy continues to be protective for the long-term, changes to the long term monitoring program are warranted. The objectives and scope of these changes will be developed through the DQO process as described in the *Uniform Federal Policy for Quality Assurance Project Plans* (UFP-QAPP) Guidance.

TABLES

TABLE 1-1

SUMMARY OF CERCLA SITES AT NCBC DAVISVILLE
FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Site	Site Description	Current Status	Reason	Date Completed
01*	Construction Equipment Department Drum Storage Area	RI	Under Investigation	Ongoing
02	Construction Equipment Department Battery Acid Disposal Area	RI	Under Investigation	Ongoing
03	Construction Equipment Department Solvent Disposal Area	RI	Under Investigation	Ongoing
04*	Construction Equipment Department Asphalt Disposal Area	RI	Under Investigation	Ongoing
05	Transformer Oil Disposal Area	NFA ROD	AR, UU	September 1995
06	Solvent Disposal Area	NFA ROD	AR, UU	September 1998
07	Calf Pasture Point	LTM	ROD Requirement	Ongoing
08	Defense Property Disposal Office (DPDO) Film Processing Disposal Area	NFA ROD	AR, UU	Soils: September 1995 Groundwater: June 1998
09	Allen Harbor Landfill	LTM	ROD Requirement	Ongoing
10	Camp Fogarty Disposal Area	NFA ROD	RA, AR, UU	June 1998
11	Former Fire Fighting Training Area	NFA ROD	AR, UU	September 1998
12	Building 316, DPDO Transformer Oil Spill Area	NFA ESD	Rem. Action, AR, UU	ROD: September 1993 ESD: September 1998
13	Disposal Area Northwest of Buildings W-3, W-4, and T-1	NFA ROD	RA, AR, UU	September 1998
14	Building 38, Transformer Oil Leak	NFA ESD	RA, Rem. Action, AR, UU	ROD: September 1993 ESD: September 1998
15*	Building 56	NFA DD	RA, AR, UU	May 1998
16	Creosote Dip Tank and Fire Training Area	RI	Under Investigation	Ongoing

Notes:

* = Study Area
RI = Remedial Investigation
NFA ROD = No Further Action Record of Decision
NFA ESD = No Further Action Explanation of Significant Differences
NFA DD = No Further Action Decision Document
LTM = Long-Term Monitoring
AR = Acceptable Risks (human health and ecological risks within acceptable ranges)
UU = Suitable for Unrestricted Use (five-year reviews not required)
RA = Removal Action performed to achieve condition of no unacceptable risks
Rem. Action = Remedial Actions performed to achieve condition of no unacceptable risks

TABLE 2-1

SUMMARY OF CHEMICALS EXCEEDING PALs IN MONITORING WELLS - SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

	PRE-ROD Dec-95	PRE-ROD May-96	PRE-ROD Aug-00	ME 01 Aug-01	ME 02 May-02	ME 03 Feb-03	ME 04 Dec-03	ME 05 Aug-04	ME 06 May-05	ME 07 Nov-06	ME 08 Feb-07
1,1,2,2-TETRACHLOROETHANE*											
MW07-03D	---	8 J	---	---	---	---	---	---	---	---	---
MW07-04D	---	77000	---	24000 J	22000 J	9300	15000	9235	2406.25 J	3735	2805
MW07-05D	---	38000 J	---	---	---	---	---	---	---	---	3440
MW07-05R	---	12000	---	6500 J	350	4750 J	5700 J	4970	1238 J	2415	3175 J
MW07-09D	---	2050 J	1250	---	1200 J	---	---	1100	---	---	568
MW07-10D	---	1500	630	---	650 J	---	---	373	---	---	182
MW07-11D	10 U	---	---	6 J	---	7.67	15	15.9	25.7 J	30.7	29.6
MW07-12D	---	61	31	48 J	11 J	---	28	41.3	21.5 J	12.9	13
MW07-13D	10 U	---	4	---	4 U	---	---	4.2	---	---	6.8
MW07-14D	---	7800	---	---	---	---	---	---	---	---	---
MW07-15D	---	45000	---	---	---	---	---	---	---	---	---
MW07-17D	---	66000 J	---	---	30000 J	---	---	16000	---	---	12150
MW07-19D	10 U	---	10	---	6 UJ	---	---	19.9	---	---	40.15
MW07-19S	---	1500	2000	---	2100 J	---	---	2200	---	---	2200
MW07-21D	---	22	480	560 J	400 J	460	570	338	325 J	278	325
MW07-21R	---	1700	2400	1800 J	1500 J	1400	1700	1410	1370 J	1180	1250
MW07-21S	310	---	190	250 J	280 J	330	470	241	390	167	276
MW07-23D	---	370	210	200 J	95 J	200	140 J	123	57.3 J	39.6	53.5
MW07-25D	---	3600 J	160	1100 J	1300 J	810	960	573	2.5 U	416	353
MW07-25R	---	510 J	1300	270 J	120 J	140	230 J	129	2.5 U	77.6	105
MW07-27D	2600	---	5500	---	3900 J	---	---	3830	---	---	3220
MW07-31I	---	12000	---	---	---	---	---	---	---	---	---
MW07-33D	---	---	---	2 J	5.9	3.08	5.55	0.50 U	3 J	0.69 U	1.6
MW07-33R	---	---	---	2.5 J	0.20	1.75	0.26	5.9	3.1 J	0.69 U	1.6
MW07-33S	---	---	---	26 J	1.73	0.625	0.20 U	0.50 U	0.50 U	0.69 U	0.69 U
MW07-34D	---	---	---	5 J	94 J	69	110 J	97.8	183 J	151	146
MW07-35D	---	---	---	---	---	---	---	528	476	349	378
MW07-37D	---	---	---	---	---	---	---	461	379 J	312	325
MW07-38D	---	---	---	---	---	---	---	423	1 U	229	195
MW07-39D	---	---	---	---	---	---	---	416	1740 J	2760	1670
MW07-39I	---	---	---	---	---	---	---	4870	6050	5650	6410
MW07-39S	---	---	---	---	---	---	---	7430	6740	7040	6690

TABLE 2-1

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FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

	PRE-ROD Dec-95	PRE-ROD May-96	PRE-ROD Aug-00	ME 01 Aug-01	ME 02 May-02	ME 03 Feb-03	ME 04 Dec-03	ME 05 Aug-04	ME 06 May-05	ME 07 Nov-06	ME 08 Feb-07
1,1,2-TRICHLOROETHANE (5 µg/L)											
MW07-04D	---	5000 U	---	**220 J**	**190 J**	**84**	**220**	**155**	**78.75 J**	**106.5**	**76.3**
MW07-05D	---	**390 J**	---	---	---	---	---	---	---	---	**31.9**
MW07-05R	---	**390 J**	---	**240 J**	**25 J**	**235 J**	**295 J**	**198.5**	**153.5 J**	**343.5**	**206**
MW07-09D	---	**315 J**	**235**	---	**170 J**	---	---	**194**	---	---	**154**
MW07-09R	10 U	---	**6**	5 J	4.16	**7.11**	3.03	**9**	**13 J**	**12.6**	**13**
MW07-10D	---	**40 J**	**24**	---	**27 J**	---	---	**19.9**	---	---	**13.4**
MW07-11D	2 J	---	---	**15 J**	**24 J**	**18**	**30**	**37.9**	**41.5 J**	**57**	**53.2**
MW07-13D	10 U	---	**8**	---	5	---	---	**7.3**	---	---	**5.7**
MW07-14D	---	**190J**	---	---	---	---	---	---	---	---	---
MW07-17D	---	**1200**	---	---	**490 J**	---	---	**368.5**	---	---	**354**
MW07-19D	10 U	---	5	---	3 J	---	---	**8.8**	---	---	**21.9**
MW07-19S	---	**130 J**	**180**	---	**120 J**	---	---	**168**	---	---	**142**
MW07-21D	---	10 U	**50**	**67**	**23 J**	**47**	**75 J**	**47.7**	**51.1 J**	**57.9**	**59.7**
MW07-21R	---	500 U	**130**	**130**	**77 J**	**77**	**140 J**	**86.3**	**101**	**102**	**92.9**
MW07-21S	**41**	---	**19**	**29**	**40**	**42**	**33**	**24.7**	**31.9**	**18.1**	**26.3**
MW07-23D	---	**22 J**	**17**	**20 J**	**9 J**	**21**	**11**	**16.8**	**7.9 J**	**9.8**	**9.3**
MW07-25D	---	500 U	**66**	**16**	**17**	**20**	**18**	**10.8**	**10.7 J**	**8.4**	**8**
MW07-25R	---	250 U	**20**	**46**	**37**	**26**	**25**	0.61 U	**24.2 J**	**12.9**	**11.2**
MW07-26S	---	**30 J**	10 U	---	---	---	---	---	---	---	---
MW07-27D	**240 J**	---	**260**	---	**140 J**	---	---	**211**	---	---	**199**
MW07-34D	---	---	---	**41 J**	**91 J**	**74**	**90 J**	**123**	**168 J**	**190**	**177**
MW07-35D	---	---	---	---	---	---	---	**13.1**	**11.3**	**8.7**	**8**
MW07-37D	---	---	---	---	---	---	---	**11.4**	**10.2 J**	**12.8**	**7.2**
MW07-39D	---	---	---	---	---	---	---	**180**	**376 J**	**535**	**329**
MW07-39I	---	---	---	---	---	---	---	**483**	**497**	**402**	**439**
MW07-39S	---	---	---	---	---	---	---	**320**	**355**	**365**	**304**
1,1-DICHLOROETHENE (7 µg/L)											
MW07-04D	---	5000 U	---	**7 J**	**21 J**	3.28	**12**	**8.3**	36 U	**9.7 J**	50 U
MW07-05R	---	**21**	---	**32**	7	**28.5**	**43**	**21.65**	**38.05 J**	50 UJ	75 U
MW07-09D	---	500 U	**9**	---	**15**	---	---	**12**	---	---	20 U
MW07-17D	---	1000 U	---	---	**79 J**	---	---	**21**	---	---	50 U

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	PRE-ROD Dec-95	PRE-ROD May-96	PRE-ROD Aug-00	ME 01 Aug-01	ME 02 May-02	ME 03 Feb-03	ME 04 Dec-03	ME 05 Aug-04	ME 06 May-05	ME 07 Nov-06	ME 08 Feb-07
1,1-DICHLOROETHENE (7 µg/L) (cont.)											
MW07-19S	---	500 U	**7.5**	---	**11 J**	---	---	**9.4**	---	---	**13**
MW07-21R	---	500 U	**11**	**18**	**15**	**16**	**8.67**	**8.4**	**10.1**	20 U	25 U
MW07-27D	16	---	**11**	---	**14 J**	---	---	**10.7**	---	---	**10.7**
MW07-39D	---	---	---	---	---	---	---	5	**12.7 J**	20 UJ	10 U
MW07-39S	---	---	---	---	---	---	---	**11.8**	15 U	50 U	50 U
1,2-DICHLOROETHANE (5 µg/L)											
MW07-04D	---	5000 U	---	**6 J**	**12 J**	3.94	**5.16**	1.7025	20 U	3.3 J	31 U
MW07-05D	---	**120 J**	---	---	---	---	---	---	---	---	6.3 U
MW07-09D	---	500 U	10 U	---	**6.54**	---	---	**8.1**	---	---	13 U
MW07-09R	10 U	---	10 U	4 J	**7.89**	**5.59**	**15**	0.41 U	**7.8 J**	**6**	3.8
MW07-26S	---	**30 J**	**22**	---	---	---	---	---	---	---	---
MW07-27D	4 J	---	**6**	---	4 J	---	---	5	---	---	**5.8**
MW07-34D	---	---	---	3 J	**29 J**	**5.43**	**5.74**	**6.2**	**8.1 J**	0.63 U	**7.6**
MW07-39D	---	---	---	---	---	---	---	4.9	**10.3 J**	13 U	6.3 U
MW07-39I	---	---	---	---	---	---	---	**6.3**	41 U	63 U	31 U
BENZENE (5 µg/L)											
MW07-05D	---	**550**	---	---	---	---	---	---	---	---	4.4 U
MW07-09D	---	500 U	4	---	**6.48**	---	---	**5.6**	---	---	8.8 U
MW07-10D	---	100 U	**12**	---	**13 J**	---	---	**6.2**	---	---	**6**
MW07-37D	---	---	---	---	---	---	---	**14.1**	**14.8 J**	**7.8**	4.6
CIS-1,2-DICHLOROETHENE (70 µg/L)											
MW07-04D	---	---	---	**170 J**	**620 E**	**150**	**170**	**147.5**	**83.5 J**	**109.8**	50 U
MW07-05R	---	---	---	**4600 J**	**760 E**	**4850 J**	**4350 J**	**2205**	**3215**	**3110 J**	**2355**
MW07-09D	---	---	**2800**	---	**960 E**	---	---	**3420**	---	---	**2950**
MW07-09R	---	---	56	**71 J**	**160 E**	**91**	**210**	**115**	**241 J**	**214**	**238**
MW07-11D	---	---	---	13 J	47	35	41	**84.6**	**146 J**	**244**	**228**
MW07-17D	---	---	---	---	**7800 E**	---	---	**1780**	---	---	**1590**
MW07-19D	---	---	47	---	54 E	---	---	**109**	---	---	**272**
MW07-19S	---	---	**1400**	---	**1600 E**	---	---	**1410**	---	---	**2100**
MW07-21D	---	---	**450**	**455 J**	**620 E**	**490**	**410**	**380**	**337 J**	**415**	**436**
MW07-21R	---	---	**2100**	**6800 J**	**1100 E**	**4000**	**1200**	**1290**	**1360 J**	**1300**	**799**

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	PRE-ROD Dec-95	PRE-ROD May-96	PRE-ROD Aug-00	ME 01 Aug-01	ME 02 May-02	ME 03 Feb-03	ME 04 Dec-03	ME 05 Aug-04	ME 06 May-05	ME 07 Nov-06	ME 08 Feb-07
CIS-1,2-DICHLOROETHENE (70 µg/L) (cont.)											
MW07-21S	---	---	460	470 J	830 E	640	540	522	798 J	356	660 J
MW07-23D	---	---	120	180 J	140 E	150	120 J	161	92.7 J	104 J	118
MW07-25D	---	---	690	17	20	18	19	12.4	10.9 J	8.6	5 U
MW07-25R	---	---	200 U	880 J	650 E	400	570 J	483	477 J	418	432
MW07-26S	---	---	590	---	---	---	---	---	---	---	---
MW07-27D	---	---	1900	---	1500 E	---	---	1520	---	---	1890
MW07-34D	---	---	---	50 J	1750 E	240	340 J	404	944 J	1020	1020
MW07-39D	---	---	---	---	---	---	---	489	1880 J	2830 J	2060
MW07-39I	---	---	---	---	---	---	---	2450	2720	2360	2410
MW07-39S	---	---	---	---	---	---	---	1490	1430	1790	1530
TETRACHLOROETHENE (5 µg/L)											
MW07-04D	---	5000 U	---	400 J	370 J	340	530	443.5	275.5 J	413.5	513.5
MW07-05D	---	735 J	---	---	---	---	---	---	---	---	331
MW07-05R	---	51	---	93	8	91 J	76.5 J	88.95	19.2 J	209	125.5
MW07-10D	---	100 U	19	---	16 J	---	15.9	---	---	---	16.6
MW07-15D	---	1000	---	---	---	---	---	---	---	---	---
MW07-17D	---	670 J	---	---	1400 J	---	---	451.5 J	---	---	315.5
MW07-21R	---	500 U	20	9	27	11	27	22.3	27.1	22.1	16.4 J
MW07-23D	---	50 U	100 U	5 J	3 J	6	2.4	3.4	2 J	4.9	3.5
MW07-25D	---	84 J	13	78	80 J	54	81 J	62.8	46.5 J	49.9	54.5
MW07-25R	---	250 U	60	24	29	15	13	20.2	11 J	14.7	22.7
MW07-31I	---	390 J	---	---	---	---	---	---	---	---	---
MW07-35D	---	---	---	---	---	---	---	51.4	40.7	44	34.6
MW07-37D	---	---	---	---	---	---	---	4.5	4.3 J	9.7	3.6
MW07-38D	---	---	---	---	---	---	---	78.7	59.2 J	71.6	79
MW07-39S	---	---	---	---	---	---	---	17	17.8 J	27 U	27 U

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	PRE-ROD Dec-95	PRE-ROD May-96	PRE-ROD Aug-00	ME 01 Aug-01	ME 02 May-02	ME 03 Feb-03	ME 04 Dec-03	ME 05 Aug-04	ME 06 May-05	ME 07 Nov-06	ME 08 Feb-07
TRANS-1,2-DICHLOROETHENE (100 µg/L)											
MW07-04D	---	---	---	100 J	140 E	38	63 J	35.25	40 U	26.3 J	50 U
MW07-05R	---	---	---	540 J	61 E	570 J	795	447.5	274.5	673 J	544.5
MW07-09D	---	---	325	---	390 E	---	---	719	---	---	780
MW07-17D	---	---	---	---	4400 E	---	---	835.5	---	---	826
MW07-19S	---	---	150	---	190 E	---	---	200	---	---	189
MW07-21D	---	---	120	170	210 E	130	110	130	114 J	103	98.8
MW07-21R	---	---	430	370 J	420 E	330	220	294	368	270	220
MW07-25D	---	---	200	7	7.08	6	6.84	5.1	4 U	5 U	5 U
MW07-25R	---	---	200 U	260 J	260 E	92	150 J	149	117 J	85.3	131
MW07-27D	---	---	490	---	510 E	---	---	383	---	---	522
MW07-39D	---	---	---	---	---	---	---	0.80 U	161 J	479 J	180
MW07-39I	---	---	---	---	---	---	---	613	729	556	521
MW07-39S	---	---	---	---	---	---	---	212	193	190	134
TRICHLOROETHENE (5 µg/L)											
MW07-03D	---	65 J	---	---	---	---	---	---	---	---	---
MW07-04D	---	46000	---	29000 J	27000 J	7200	30000	17350	13400 J	14700	12450
MW07-05D	---	46500 J	---	---	---	---	---	---	---	---	7540
MW07-05R	---	27000	---	24000 J	1200 J	16000 J	28000 J	17950	9530 J	30000	28600
MW07-09D	---	5500	5150	NA	8200 J	---	---	8030	---	---	7790
MW07-09R	10 U	---	3	4	5.1	14	9.46	9.2	21.3 J	21.1	31.7
MW07-10D	---	860 J	1000	---	630 J	---	---	519	---	---	513
MW07-11D	10 U	---	---	1 UJ	2.62 U	2.39	4.39	9.2	30.2 J	90.5	73.5
MW07-12D	---	2 J	4	4	3	---	4.26	10.3	6.9 J	8.2	8.7
MW07-13D	26	---	63	---	88	---	---	101	---	---	156
MW07-14D	---	6500	---	---	---	---	---	---	---	---	---
MW07-15D	---	47000	---	---	---	---	---	---	---	---	---
MW07-17D	---	120000	---	---	62000 J	---	---	38150	---	---	57600
MW07-19D	10 U	---	34	---	56 J	---	---	259	---	---	1018.5 J
MW07-19S	---	3400	5450	---	7200 J	---	---	4430	---	---	7970
MW07-21D	---	82	2800	3200 J	4400 J	3200	4900	3530	2670 J	4180	4500
MW07-21R	---	5800	10000	4200 J	9900 J	4200	8500	6950	8490 J	9780	10000

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	PRE-ROD Dec-95	PRE-ROD May-96	PRE-ROD Aug-00	ME 01 Aug-01	ME 02 May-02	ME 03 Feb-03	ME 04 Dec-03	ME 05 Aug-04	ME 06 May-05	ME 07 Nov-06	ME 08 Feb-07
TRICHLOROETHENE (5 µg/L) (cont.)											
MW07-21S	590	---	480	310 J	770 J	540	560	397	769 J	305	715 J
MW07-23D	---	460	690	870 J	580 J	610	710 J	621	349 J	434	534
MW07-24DUT	---	---	---	7 J	8.5	9.2	11	9	10.5 J	14	8.7
MW07-25D	---	3000	1800	1600 J	2000 J	970	1400	923	1180 J	1120	1000
MW07-25R	---	2900	1400	3100 J	1000 J	1000	2200 J	1860	1950 J	1950	2150
MW07-26S	---	23 J	21	---	---	---	---	---	---	---	---
MW07-27D	10000	---	12000	---	13000 J	---	---	9920	---	---	12400
MW07-31I	---	2800	---	---	---	---	---	---	---	---	---
MW07-33D	---	---	---	14 J	31	18 J	34	17.4	22.2 J	24.1	16.7
MW07-33R	---	---	---	14	3.89	11	4.65	22	17.9 J	14.6	14.9
MW07-33S	---	---	---	30 J	3.1	2.57	0.40 U	0.49 U	2.1	0.83 J	0.74 U
MW07-34D	---	---	---	2 UJ	16.5 J	22	49	47.3	198 J	355	337 J
MW07-35D	---	---	---	---	---	---	---	1010	982	1210	1080
MW07-37D	---	---	---	---	---	---	---	908	749 J	800	911
MW07-38D	---	---	---	---	---	---	---	628	685 J	628	366
MW07-39D	---	---	---	---	---	---	---	1350	8050 J	29000	9340
MW07-39I	---	---	---	---	---	---	---	19800	25000	28200	31800
MW07-39S	---	---	---	---	---	---	---	14700	17000	20600	17100
VINYL CHLORIDE (2 µg/L)											
MW07-01S	23	---	---	---	---	---	---	---	---	---	---
MW07-03D	---	31 J	---	---	---	---	---	---	---	---	---
MW07-04D	---	5000 U	---	2 J	5 J	3.14	4.27	3.45	25 U	6.9 J	50 U
MW07-05R	---	17	---	170 J	42	330 J	545 J	284.5	224.5 J	470 J	183
MW07-09D	---	500 U	24.5	---	58 J	---	---	104	---	---	169
MW07-09R	10 U	---	10 UJ	3 J	4.175	4.49	6.4	3.5	7.3 J	5.3	9.5
MW07-11D	10 U	---	---	1 J	2.97 J	1.73	3.75	4.8	4.7 J	1 U	7.7
MW07-17D	---	1000 U	---	---	120 J	---	---	60.85	---	---	69.2
MW07-19D	10 U	---	3	---	5 J	---	---	7.1	---	---	12.05
MW07-19S	---	500 U	11.5 J	---	20 J	---	---	23.8	---	---	24.6
MW07-21D	---	1 J	9	8.5	11	9.63	13	9.7	4.9 U	10.8	11.3

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	PRE-ROD Dec-95	PRE-ROD May-96	PRE-ROD Aug-00	ME 01 Aug-01	ME 02 May-02	ME 03 Feb-03	ME 04 Dec-03	ME 05 Aug-04	ME 06 May-05	ME 07 Nov-06	ME 08 Feb-07
VINYL CHLORIDE (2 µg/L) (cont.)											
MW07-21R	---	500 U	**14**	**23**	**22**	**15**	**15**	**13.1**	**14.1**	20 U	25 U
MW07-21S	10 U	---	10 UJ	2	**5.94**	**2.14**	**2.97**	**3.2**	**3.8**	1.8	**3**
MW07-23D	---	50 U	100 UJ	**4 J**	**4 J**	**5.07**	**3.13**	**3.8**	**2.3 J**	**3.3 J**	**3.9**
MW07-25D	---	500 U	**19**	1 U	0.12	0.60 U	0.60 U	0.49 U	2.5 U	5 U	5 U
MW07-25R	---	250 U	200 UJ	**22**	**18**	**9.62**	**11**	**13.8**	**10.1 J**	**7.9**	**14.7**
MW07-26S	---	100 U	**5**	---	---	---	---	---	---	---	---
MW07-27D	**13**	---	**50**	---	**81 J**	---	---	**82.7**	---	---	**105**
MW07-27S	---	---	---	---	---	---	---	**5.3**	**6.2 J**	1 U	**4**
MW07-33S	---	---	---	1 U	0.73	**2.52**	**6.21**	0.49 U	**5.3**	**8.1**	1.4
MW07-34D	---	---	---	**3 J**	**30.5 J**	**8.15**	**8.68**	**10.3**	**16.4 J**	**19.4**	**19.9**
MW07-39D	---	---	---	---	---	---	---	**16**	**50.8 J**	**87.2 J**	**57.7**
MW07-39S	---	---	---	---	---	---	---	**31.6**	9.8 U	50 U	50 U
MW09-39I	---	---	---	---	---	---	---	**142**	**87.6 J**	100 U	**118**
ANTIMONY (6 µg/L)											
MW07-04D	42 UJ	---	---	1.8 U	2.5 U	**7.4**	0.21 U	2.25 U	1.6 UJ	3.3 U	1.6 U
MW07-33S	---	---	---	1.8 U	2.5 U	**14.55 J**	0.21 U	3.1 U	1.6 UJ	3.3 U	1.4 U
ARESENIC (10 µg/L)											
MW07-09R	---	---	---	5 U	4.9 U	6.9 U	**14.2**	3.2 U	2.3 U	3.7 U	1.3 U
MW07-11D	---	---	---	5 U	4.9 U	6.9 U	**19.8**	3.1 J	3.9 U	8	**34.9 J**
MW07-13S	---	---	---	---	4.9 U	---	---	**11.7**	---	---	5.1 J
MW07-16D	---	---	---	---	---	---	---	---	---	---	**50.8 J**
MW07-18D	---	---	---	---	---	---	---	---	---	---	**45.6 J**
MW07-20D	---	---	---	---	---	---	---	---	---	---	**50.9 J**
MW07-20S	---	---	---	---	---	---	---	---	---	---	**34.7**
MW07-24DUT	---	---	---	5 U	9.35 J	6.9 U	**13**	4 J	5.7 U	5.1	1.5 J
MW07-34D	---	---	---	5 U	4.9 UJ	6.9 U	**11.3**	2.2 U	2.3 U	4 J	1.9 J
MW07-38D	---	---	---	---	---	---	---	**56**	2.3 U	3.7 U	1.3 U
MW07-39S	---	---	---	---	---	---	---	**24.1**	**17.6 J**	**19.6**	**19**
MW07-39I	---	---	---	---	---	---	---	**64.8**	11 U	9.4	9.4

SUMMARY OF CHEMICALS EXCEEDING PALs IN MONITORING WELLS - SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

	PRE-ROD Dec-95	PRE-ROD May-96	PRE-ROD Aug-00	ME 01 Aug-01	ME 02 May-02	ME 03 Feb-03	ME 04 Dec-03	ME 05 Aug-04	ME 06 May-05	ME 07 Nov-06	ME 08 Feb-07
BERYLLIUM (4 µg/L)											
MW07-11D	---	---	---	0.48 U	0.11 U	0.28 U	0.06 J	0.16 J	0.18 U	0.22 U	**13.9**
MW07-16D	---	---	---	---	---	---	---	---	---	---	**21.9 J**
MW07-18D	---	---	---	---	---	---	---	---	---	---	**19.7 J**
MW07-20D	---	---	---	---	---	---	---	---	---	---	**21.9 J**
MW07-20S	---	---	---	---	---	---	---	---	---	---	**15.5 J**
LEAD(15 µg/L)											
MW07-04D	---	---	---	**39.6 J**	2.6 U	3.4 U	0.24 J	1.5 U	1.9 U	1.5 U	1.7 U
MW07-05R	---	---	---	**46.8 J**	2.6 U	3.4 U	0.0625 J	1.5 U	1.9 U	1.5 U	1.7 U
MW07-09R	---	---	---	**18.5 J**	2.6 U	3.4 U	0.22 J	1.5 U	2.25 U	1.5 U	1.7 U
MW07-11D	---	---	---	**41.4 J**	2.6 U	3.4 U	0.32 J	1.5 U	3.8 U	1.5 U	11.2
MW07-12D	---	---	---	**55.6 J**	2.6 U	---	0.27 J	1.5 U	1.9 U	1.5 U	1.7 U
MW07-16D	---	---	---	---	---	---	---	---	---	---	**18.3**
MW07-18D	---	---	---	---	---	---	---	---	---	---	**16.4**
MW07-20D	---	---	---	---	---	---	---	---	---	---	**19.25**
MW07-21D	---	---	---	**45.4 J**	2.6 U	3.4 U	0.35 J	1.5 U	1.9 U	1.5 U	1.7 U
MW07-21R	---	---	---	**40.2 J**	2.6 U	3.4 U	0.16 J	1.5 U	1.9 U	1.5 U	1.7 U
MW07-24DUT	---	---	---	**37.9 J**	2.6 U	3.4 U	0.05 UJ	1.5 U	1.9 U	1.5 U	1.7 U
MW07-25D	---	---	---	**33.1 J**	2.6 U	3.4 U	0.44 J	1.5 U	1.9 U	1.5 U	1.7 U
MW07-25R	---	---	---	**45.7 J**	2.6 U	3.4 U	0.30 J	1.5 U	1.9 U	1.5 U	1.7 U
MW07-33D	---	---	---	**52.3 J**	2.6 U	3.4 U	0.14 J	1.5 U	1.9 U	1.5 U	1.2 J
MW07-33S	---	---	---	**41.4 J**	2.6 U	3.4 U	0.29 J	1.5 U	1.9 U	1.5 U	0.92 U
MW07-34D	---	---	---	**60.2 J**	2.6 U	3.4 U	0.12 J	1.5 U	1.9 U	1.5 U	1.7 U

Notes:
1. when duplicate values were encountered the average of the two values was used.
2. Project Action Level (PAL) = MCL, unless RIDEM GA goal is more stringent.
3. * = Constituent has no PAL.
4. **Bold** = Criteria Exceeded
5. U = Not Detected
6. UJ = Detection Limit Approximate
7. J = Quantitation Approximate
8. NA = Not Analyzed
9. E = Exceeded Instrument Calibration Range
10. µg/L = Micrograms Per Liter

TABLE 2-2

SUMMARY OF CHEMICALS EXCEEDING PROJECT ACTION LIMITS IN PIEZOMETERS - SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Sample ID	ME 01 Aug-01	ME 02 May-02	ME 03 Feb-03	ME 04 Dec-03	ME 05 Aug-04	Bi-Month Oct-04	Bi-Month Nov-04	Bi-Month Jan-05	Bi-Month Mar-05	Bi-Month Apr-05	ME 06 May-05	Bi-Month Jul-05	Bi-Month Sep-05	Bi-Month Nov-05	Bi-Month Jan-06	ME 07 Nov-06	ME 08 Feb-07
1,1,2,2-TETRACHLOROETHANE (13.9 µg/L)																	
P07-05	1 U	20.5 J	31	0.20 U	0.50 U	0.50 U	0.50 U	---	23.9	31.7	10	0.50 U	0.50 U	0.70 J	0.23 U	0.69 U	1.8
P07-06	1 U	1 U	0.20 U	0.20 U	0.50 U	0.50 U	0.50 U	---	0.50 U	3.1	1.1 J	0.50 U	0.50 U	358	0.23 U	0.69 U	0.69 U
P07-07	5	65.5 J	63	480 J	249	161	236	305	268	308	443	340	284 J	338	322	221	285.5
P07-08	1 U	---	120	1200	550	368	599	465	538	546	531	427	394	205	343	4.7	82.6 J
P07-09	1 U	33	110	1100	464	227.5 J	613.5	584	419.5	501	686.5	487.5	438.5	379.5	218.5 J	139.5 J	156.3 J
P07-10	14	17 J	130	98 J	86.1	31.3	80.4	78.8	63.5	72	64.9	78.5	39.9	66.8	59.9	66.2	78 J
P07-15	---	1 U	4.01	4.85	2.25 J	---	---	---	---	---	34.05	---	---	---	---	20.1	14.8
P07-20	---	6.88	88	0.20 UJ	5	---	---	---	---	---	213	---	---	---	---	0.69 U	19.3
P07-21	---	36	14 J	0.20 UJ	35.6	---	---	---	---	---	20.5	---	---	---	---	0.69 U	26.4
P07-22	---	63	57	100	32.85	---	---	---	---	---	84.25	---	---	---	---	0.69 U	18.4
P07-23	---	36	10	32	14	---	---	---	---	---	26.3	---	---	---	---	0.69 U	17.7 J
P07-24	---	7.73	41	29	32.4	10.5	36.3	34.2	37	44.2	47.7	23.4	9.3	29.2	34.7	32.65	35.8
1,1,2-TRICHLOROETHANE (60.2 µg/L)																	
P07-08	0.20	---	14	94	55.1	55.2	3.1 U	44	54.2	51.3	45	31.2	33.5	20.4	29.2	0.67 U	6.5
P07-09	0.70	4.01	19	150	68.35	35.65 J	67.15	76.6	61.2	62.35	85.45	59.15	41.2	48.25	24.25 J	16.2 J	18.7 J
1,1-DICHLOROETHENE (4.29 µg/L)																	
P07-08	1 U	---	2.25	7.06	2.5	5.5	3.6 U	3.6 U	4.3 J	7.3 U	3.8 J	0.73 U	3.6 U	2	2.2 U	1 U	1.9
P07-09	1 U	0.75	3.05	9.77	5.5	6.25	0.73 U	5.45 U	4.05	3.1	5.78 J	5.45	7.3 U	5.05 J	0.45 UJ	1 U	4.05 J
TRICHLOROETHENE (184 µg/L)																	
P07-06	1 U	0.26	0.90 U	0.69 J	0.49 U	0.49 U	0.49 U	---	0.49 U	5.5	4.8	0.49 U	0.88 J	374	0.26 U	0.74 U	0.74 U
P07-07	0.50	31.5 J	18	365 J	160.5	238	115	401	376	424	575	316	273 J	664 J	313	110	398.5
P07-08	1 U	---	120 J	2700	1050	1620	1340	1320	1830	1650	1380	1280	1220	104	531	3.3	74.8
P07-09	1 U	9.55	270 J	3900	1695	1520	1870	2195	2200	1820	2595	2160	1875	1655	235.5	276.35 J	1064 J
P07-10	10	13 J	280 J	190	302	370	267	328	322	266	191	275	153	249	180	284	175
TOTAL 1,2-DICHLOROETHENE (986 µg/L)																	
P07-07	37	270.5	226	1035	615.25	879.3	709.5	833.2	1153.8	1210.7	1412.2	1148.7	921.2	782.2	1149.3	593.2	1195.8
P07-08	1.2	---	437	1520	692.6	904	896.5	920.7	1095.4	987.6	1097.2	595.1	775.9	782.2	949.3	117	555.4
P07-09	0.60	226	351	2050	1243	1010.5	1325.5	1361.5	1456	1491	1713	1326	1554.5	1325.5	586.9	416.45	1477

TABLE 2-2

SUMMARY OF CHEMICALS EXCEEDING PROJECT ACTION LIMITS IN PIEZOMETERS - SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Sample ID	ME 01 Aug-01	ME 02 May-02	ME 03 Feb-03	ME 04 Dec-03	ME 05 Aug-04	Bi-Month Oct-04	Bi-Month Nov-04	Bi-Month Jan-05	Bi-Month Mar-05	Bi-Month Apr-05	ME 06 May-05	Bi-Month Jul-05	Bi-Month Sep-05	Bi-Month Nov-05	Bi-Month Jan-06	ME 07 Nov-06	ME 08 Feb-07
VINYL CHLORIDE (3.78 µg/L)																	
P07-04	1 U	1 U	0.60 U	2.99	2.6	2.8	0.49 U	---	3	1.7 J	**4.5**	0.49 U	0.49 U	1.8	0.83 U	1 U	1.4
P07-05	1 U	**4.26 J**	3.35	**42**	**19.3**	**32.3**	**17.5**	---	**14.6**	**38**	**8.7**	**46.3**	**5.6**	**16.9**	**35.9**	**31.4 J**	**19.8**
P07-06	1 U	1.46	**5.42**	**12 J**	**12.2**	**21.9**	**12.7**	---	**6.8**	**8.4**	**7.8**	**22.2**	**24.1**	**68.5**	**18.7**	**16.9**	**11.1**
P07-07	0.60	3.73 J	**3.94**	**64 J**	**193.5**	**243**	**159**	**13.1**	**22.5**	**23.4**	**21.9**	**127**	**179 J**	**59.8**	**31.1**	**89.2**	**24.65**
P07-08	1 U	---	**7.56**	**76**	**9.9**	**34.3**	2.5 U	**33.2**	**22.7**	**10.2 J**	**13.5**	**5.1**	**18.8**	**126**	**55.5**	**70.5**	**165**
P07-09	1 U	2.18	**13**	**48**	**43.8**	**95.85**	**48.1**	**37.35**	**29.6**	**23.95**	**32.75 J**	**46.65**	**31**	**61.05**	**78.4**	**46.8**	**92.8 J**
P07-10	1 U	1 J	**13**	**11 J**	**4.2**	**10**	0.49 U	0.49 U	**16.7**	**8.9**	**13.4**	0.49 U	1.9	**4.4**	**4.7**	**4**	**15.3**
P07-20	---	0.52	1.85	0.60 UJ	0.49 U	---	---	---	---	---	2.6 J	---	---	---	---	**31.5**	**96.4**

Notes:

1. Project Action Limits (PALs) are the risk-based screening concentrations presented in the Conceptual Long-Term Monitoring Plan (CLTMP), Table 3, Site 07 (New Fields, 2000).
2. Total 1,2-dichloroethene is reported as the sum of results for *cis*- and *trans*-1,2-dichloroethene.
3. When duplicate values were encountered the average of the two values was used.
4. **Bold** = Criteria Exceeded; U - Not Detected, UJ - Detection Limit Approximate, J - Quantitation Approximate, NS - Not Sampled

TABLE 2-3

COMPARISON OF GROUNDWATER MONITORING CRITERIA
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

Chemical	Federal MCLs and/or RIDEM GQS (2002)(1)	Federal MCLs and/or RIDEM GQS (2007)(2)
VINYL CHLORIDE	2	2
1,1-DICHLOROETHENE	7	7
CHLOROFORM	80	80
1,2-DICHLOROETHANE	5	5
BENZENE	5	5
TRICHLOROETHENE	5	5
TOTAL 1,2-DICHLOROETHENE	70	70
1,1,2-TRICHLOROETHANE	5	5
TETRACHLOROETHENE	5	5
1,1,2,2-TETRACHLOROETHANE	NA	NA
ALUMINUM	NA	NA
ANTIMONY	6	6
ARSENIC	10	10
BERYLLIUM	4	4
CHROMIUM	100	100
IRON	NA	NA
LEAD	15	15
MANGANESE	NA	NA
NICKEL	NA	NA

Notes:

NA - Not available.

RIDEM - Rhode Island Department of Environmental Management.

1 - QAPP for Long Term Monitoring Plan of Site 07 (EA, May 2002).

2 - Lesser of USEPA MCLs (USEPA, August 2006) or RIDEM Groundwater Quality Standards (RIDEM, March 2005).

TABLE 2-4

COMPARISON OF AWQC USED IN SITE 07 RISK ASSESSMENT WITH CURRENT VALUES
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

Parameter	AWQC (1) (ug/L)	AWQC (2) (ug/L)
1,1,2,2-Tetrachloroethane	2400	NA
1,1,2-Trichloroethane	9400	NA
1,1-Dichloroethane	20000	NA
1,1-Dichloroethene	580	NA
1,2-Dichloroethane	20000	NA
1,2 Dicholoethene (total)	580	NA
1,2-Dichloropropane	3040	NA
cis-1,2-Dichloropropene	244	NA
2-Butane	6000	NA
Benzene	700	NA
Bromodichloromethane	15215	NA
Carbon Disulfide	210	NA
Chlorobenzene	50	NA
Chloroform	1240	NA
Styrene	201	NA
Tetrachloroethene	450	NA
Toluene	5000	NA
Trichloroethene	100	NA
Xylenes (total)	1340	NA
Site 07 Metals - Saltwater AWQC		
Arsenic	36	36
Barium	340	NA
Beryllium	5.3	NA
Cobalt	250	NA
Copper	2.9	3.1
Iron	1000	NA
Manganese	2500	NA
Mercury	0.025	0.94
Nickel	8.3	8.2
Selenium	71	71
Thallium	107	NA
Zinc	86	81

Notes:

1. Aquatic Water Quality Criteria (AWQC) listed in Table 5-6 of 1998 RI Report for Site 07. Please note that most of the AWQC listed in Table 5-6 of the Site 07 report are not published AWQC. Rather the values are taken from a variety of references as indicated on the table.
2. Aquatic Water Quality Criteria from National Recommended Water Quality Criteria (USEPA, 2006)

TABLE 3-1

SUMMARY OF DETECTED ANALYTES EXCEEDING PALs
IN GROUNDWATER - SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND
PAGE 1 OF 2

Analytes (PAL in µg/L)	ME 01 Dec 2001/ Jan 2002	ME 02 Feb-Mar 2002	ME 03 Jun 2002	ME 04 Sep 2002	ME 05 Jan 2003	ME 06 Apr-May 2003	ME 07 Jun-Jul 2003	ME 08 Sep 2003	ME 09 Dec 2003	ME 10 Mar 2004	ME 11 Jun 2004	ME 12 Aug 2004	ME 13 Oct 2004	ME 14 Mar 2005	ME 15 Jun 2005	ME 16 Sep 2005	ME 17 Dec 2005	ME 18 March 2006	ME 19 Nov 2006	ME 20 Mar 2007
MW09-03D																				
trichloroethene* (5)	7.29	7 UJ**	6 J	6.62	5.67 UJ**	5.04	**4.37 J**	7.29 J	5.22	7.3	6.3	6.6	5.4	6.5	**4.9**	4.7	5.5	5.4	**2.7**	5.4
cis-1,2-DCE* (70)	130	140	150 J	120	120 J	110 J	110	120 J	150	140	118	121	123	123	118	110	129	109	105	148
vinyl chloride* (2)	26	17	16 J	24	18	18 J	9.98	19 J	17	20	19	18.4	19.1	17.5	22.2	29.9	19.2	13.2 J	18.6	18.5
antimony (6)	1.8 U	1.8 U	2.5 U	1.8 U	2.5 U	0.53 U	0.21 U	0.21 U	0.21 U	0.06 UJ	9.1	1.8 U	1.7 U	1.6 U	2.4 U	1.9 U	1.6 U	2.4 U	3.3 U	1.4 U
arsenic (10)	5 U	5 UJ	4.9 U	10 J	0.64 U	1.2 J	**1.8**	**1.7**	**1.6 J**	0.63 U	**6**	2.2 U	2.2 U	2.3 U	3.3 U	2.3 U	2.3 U	3.3 U	3.7 U	0.74 U
MW09-07S																				
benzene* (5)	58	69	54 J	46	32	28 J/34	31	22	29 J	26	21.9	22.6/22	17.6/17.7	12.1/12	11.8/11.9	9.9/10.2	9.1/9.5	22.1/22.3	10.4/11.1	18.1/17.9
naphthalene* (20)	23 J	**16 J**	23 J	**11 J**	**6.1 J**	20/20	23 J	26	22	23	**17.8**	**13.8/15.4**	**14.7/19**	22.9/20.7	27.4/24.5	**18.5/10.9**	**13.9/16.7**	17.3 J/27 J	**7.6/10.9**	22.9 J/26.2
arsenic* (10)	13.4	5 U	21.4	30 J	21.2	21.6/21.8	25.6	24.4	26.8 J	22.9 J	19.4	19 J/19.9	17.4 J/18.8 J	22.9/22.4	16.9/17.8	20.1/22.1	20.7/19.7	19.6/20 J	15.6/15.3	16/14.1
MW09-08S																				
trichloroethene (5)	6.28	5 U/5 U	1 U	1 U	**1.68**	2.13 U	**0.34 J**	0.32 U	**0.25 J**	**0.31 J**	2 U	0.49U	0.49U	2 U	**1.7 J**	0.49 U	0.26 U	0.26 U	0.74 U	**1.3**
vinyl chloride* (2)	23	19/20	17 J	12 J	33	37	21	14 J	18	20	17.2	19.3	19.4	23.2	28.5 J	17.5	15.6	18.9 J	15.3	15.5
arsenic* (10)	5 U	5 UJ/5 UJ	10.1	4.9 U	**9.3**	10.9	14.7	15.5	15.5 J	11.5 J	**8.8**	**8.9**	**9**	11.8	11 J	8.5	7.1 U	11.7	3.7 U	**9**
MW09-09S																				
benzene* (5)	**4.26**	**5**	5.07	**4.3**	**4.42**	**4.39**	9.79	5.65	5.12 J/5.21	6.4 J/6.14	5.9/5.9	5.9 J	6.6 J	7	7.5	6.8	6.3	6.9	6.4	7.2
cis-1,2-DCE* (70)	N/A	**24**	120J	**4.42**	79	120	140	120J	120/420	200/190	198/199	**51**	246	176	266	**41.1**	192	149	**53.5**	176
vinyl chloride* (2)	38	21	62 J	16	90	140 J	110	130 J	130/410	170/150	153/149	56.6	247	226	293	118	205	192 J	64.6	155
MW09-10S																				
vinyl chloride (2)	2.23	**2 J**	**1.68**	**1.54**	2.42	1.7 J/2.2 J	1 U	**1.04 J**	**1.33**	**1.3**	**1.4**	0.49 U	0.49 U	**1.3 J**	0.49 UJ	0.49 U	**1.2**	**1.3 J**	1 U	**1.1**
antimony (6)	1.8 U	1.8 U	**3.8 J**	5.7 U	2 U	0.53 U/0.53 U	0.21 U	0.21 U	0.21 U	0.1 U	8.6	1.7 U	1.9 U	1.6 U	1.6 U	1.6 U	1.6 U	2.4 U	3.3 U	2.3 U
arsenic* (10)	**9.7 J**	**5.3 J**	13	4.9 U	**8.8**	13.6 J/12.8 J	10.7	19.6	22.9 J	11.7 J	15.7	11.1	**9**	9.9 U	**7.9 J**	10.4	11.5	14.4	3.7 U	**6.2**
MW09-10D																				
arsenic (10)	5 U	5 U	6.7 J/10.2	4.9 U/4.9 U	**5.6**	**8.5 J**	**6.8 J/8.1**	**8.2**	**8.2 J**	**8.5 J**	**5.8**	**5.7**	**9.6**	8 U	**7.1 J**	7.9	**9**	**7**	**5.8**	6.4
MW09-11S																				
chlorobenzene (100)	300	230	**55**	**53 J**	**26**	**20**	**41**	**34**	140	**19**	**40**	151	**21.9**	**6.1**	**9.1**	258	**47.9**	**6.9 J**	**65.8**	182
aroclor-1260 (0.5)	0.25 U	**0.15**	0.1 U	0.21 U	0.1 U	0.1 U	**0.07 J**	0.1 U	**0.14**	**0.94**	**0.13 J**	**0.15 J**	0.71	**0.17 J**	**0.35**	0.33	**0.18 J**	**0.40**	**0.39**	**0.19 J**
chromium (100)	6.4 U	6.4 U	314	0.53 UJ	0.22 U	**0.38 J**	**0.74 J**	**8.8**	**9.6 J**	**6.4 J**	**8.1 J**	0.26 U	0.26 U	0.53 U	0.72 U	0.53 U	0.53 U	0.53 U	0.67 U	0.30 U
nickel (100)	7.3 U	**12 J**	202	**5.8 J**	**10**	**21.4**	**25.3**	**22.8 J**	**9.7 J**	**43.7**	**28.4**	**3.3 J**	**42.4**	**19.8 J**	6.2 U	43	**20.8 J**	7 U	**31.8 J**	**10 J**
MW09-14D																				
antimony (6)	1.8 U/1.8 U	1.8 U	6.8	7.1 J	0.23 U	0.53 U	0.21 U	0.21 U	0.21 U	0.06 UJ	5 U	2.3 U	1.7 U	1.6 UJ	2.4 U	3.7 U	1.6 U	2.4 U	3.3 U	1.6 U
MW09-20I																				
1,1,2,2-tetrachloroethane	**140,000**	**150,000**	**240,000 J**	**150,000**	**170,000 J**	**170,000**	**87,000 J**	**140,000/140,000**	**160,000**	**190,000**	**123,000 J**	**116000/132000**	**136,000/135,000**	**104,000/93,700**	**137,000J/144,000J**	**94,800/76,200**	**135,000/138,000**	**99,000/92,400**	**129,000/129,000**	**114,000J/42,300J**
1,1,2-TCA* (5)	3,300 J	3,200 J	38,000 J	1 U	4,300 J	3,800 J	10,000 U**	10,000 U/88 J	1,000 U**	**4,400**	3,770 J	4,150/3,440	3,910/4,230	3,330 J/3,550	3,290 J/3,900	2,800/2,890	340 UJ/4,240 J	2,700/2,520	4,360/4,590	1,200 J/ 3,330 J
1,2,-DCA (5)	10,000 U**	12 J	R	1 U	R	10,000 U**	10,000 U**	10,000 U**	1,000 U**	1,000 U**	12.8 J	14.1 J/12.5 J	13 J/13.5 J	4,000 U**/100 U**	11.3 J/0.41 UJ	82 U/26.3 J	230 U**/11 U**	110 U**/230 U**	630 U**/630 U**	130 U**/1,300 U**
1,1-DCE* (7)	10,000 U**	280 J	6,400 J	590 J	1,600 J	10,000 UJ**	10,000 U**	10,000 U/30	230 J	N/A	273 J	301 J/284 J	297J/315 J	2000 U/212	275 J/0.73 UJ	310/329 J	450 UJ/227 J	220 U**/450 U**	1,000 U**/1,000 U**	421 J/2,000 UJ
benzene (5)	10,000 U**	8 J	130 J	11	R	10,000 U**	2,100 J	10,000 U**/0.65 U	1,000 U**	1,000 U**	6.8 J	7 J/6.6 J	7.4 J/7.6 J	1000 U**/25 U**	5 J/6.6 J	72 U/20 J	10 U**/200 U**	100 U**/200 U**	440 U**/440 U**	88 U**/880 U**
chloroform (80)	10,000 U**	83 J	1,300 J	94 J	450 J	10,000 U**	10,000 U**	**10,000 U**/6.32**	1,000 U**	1,000 U**	**72.4 J**	**78.4 J/67.2 J**	**71.2 J/76.4 J**	**4000 U**/69 J**	**60.8 J/70.5 J**	**130 U**/46 J**	**270 UJ**/72.4 J**	140 U**/270 U**	590 U**/590 U**	120 U**/1,200 U**
cis-1,2-DCE* (70)	45,000	9,100E	120,000J	27,000	36,000J	36,000	35,000	37,000J/39,000J	45,000	47,000	37,800 J	39,200/33,800	36,200/36,000	39,800/40,700	39,900 J/37,700	28,000/9,940	700 UJ/38,100 J	35,900/34,300	39,400/38,200	25,600/26,800
methylene chloride (5)	10,000 U**	5 UJ	130 J	5.44	54 J	1,900 J	2,200 U**	10,000 U**/0.78 U	1,200 U**	N/A	13.5 U**	13.9 J/11.2 J	15.3 J/16.8 J	4000 U**/100 U**	12 J/10.4 J	280 U**/9.3 J	630 U**/31 U**	310 U**/630 U**	650 U**/650 U**	143 J/1,300 UJ**
trans-1,2-DCE* (100)	21,000	8,100 E	56,000 J	16,000	18,000 J	17,000	16,000	17,000/19,000	20,000	22,000	17,500 J	18,700/15,700	18,600/18,200	18,100/16,300	17,500 J/18,700	15,300/6,590	13,900/17,400	17,200/15,900	20,300/20,100	10,400 J/16,100 J
tetrachloroethene (5)	10,000 UJ**	180 J	3,500 J	320 J	720 J	10,000 U**	10,000 U**	10,000 U**/6.08	1,000 U**	160 J	218 J	177 J/202 J	168 J/145 J	4000 U**/181	188 J/211 J	265/275 J	440 UJ**/138 J	220 U**/440 U**	540 U**/540 U**	375 J/1,100 UJ**
trichloroethene* (5)	420,000	420,000	510,000J	480,000	500,000 J	450,000	420,000	360,000/400,000J	410,000	570,000	371,000 J	392,000/335,000	404,000/447,000	401,000/404,000	400,000 J/449,000 J	383,000/207,000	321,000/375,000	287,000/282,000	507,000/475,000	188,000 J/430,000 J
vinyl chloride* (2)	3,000 J	1,800 J	17,000 J	1,400 J	4,900	10,000 U**	10,000 U**	10,000 U**/220 J	2,400	2,500	3,040 J	2,970/2,690	1,990J/2,030	4600/3080	5610 J/3840 J	2,870/2,140 J	1,490/2,370	4,380 J/4,180 J	3,120/3,300	4,430 J/2,880 J
antimony (6)	1.8 U	1.8 U	6.7 J	7.6 J	2 U	0.53 U	0.21 U	0.21 U/0.21 U	0.21 U	0.11 U	2.9 U	1.7 U/1.7 U	1.7 U/5.5 U	1.6 U/1.6 U	1.6 U/1.6 U	1.6 U/1.6 U	1.6 U/1.6 U	2.4 U/1.6 U	3.3 U/3.3 U	1.4 U/1.4 U
arsenic (10)	5 U	5 UJ	**8 J**	**6.7 J**	**5.7**	**9.8**	**7.9**	10.6/11.2	10.6 J	10.5 J	**4.2**	**7.6/6.5**	**4.3 J/7.5**	**8.2/7**	**8.2 J/8.3 J**	11.9 U**/9.1 U	8.2 J/8 U**	11.6 J/5.6 J	4.9/3.7 U	10.6/11.4
MW09-20D																				
trichloroethene (5)	1 U	5 U/5 UJ	1 U	**0.53 J**	3.79 U	**2.1**	**1.69**	1.11 U/0.44 U	**0.9 J**	**0.42 J**	**1.5 J**	**1 J**	0.49 U	**1.8 J**	0.49 U	73.9	**1.4**	0.26 U	0.74 U	0.74 U
vinyl chloride* (2)	1 U	5 U**/5 U**	**0.34**	**0.35 J**	**0.39 J**	**0.79 J**	1 U	1 UJ/0.47 U	**0.83 J**	**0.91 J**	**1.5 J**	0.49 U	0.49 U	2.8	3.4 J	4.3	3.2	4.1 J	2.9	6.2
arsenic (10)	5 U	5 UJ/5 UJ	4.9 U	11 J	**2.6**	**4.4**	**3.5**	**4/4.1**	**4.3 J**	**4.2 J**	**4 U**	**3.9 J**	**3.8 J**	**4.5 J**	**4.9 J**	6.4 U	7.7 U	5.5	3.7 U	3.4 U

TABLE 3-1

SUMMARY OF DETECTED ANALYTES EXCEEDING PALs
IN GROUNDWATER - SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND
PAGE 2 OF 2

Analytes (PAL in µg/L)	ME 01 Dec 2001/ Jan 2002	ME 02 Feb-Mar 2002	ME 03 Jun 2002	ME 04 Sep 2002	ME 05 Jan 2003	ME 06 Apr-May 2003	ME 07 Jun-Jul 2003	ME 08 Sep 2003	ME 09 Dec 2003	ME 10 Mar 2004	ME 11 Jun 2004	ME 12 Aug 2004	ME 13 Oct 2004	ME 14 Mar 2005	ME 15 Jun 2005	ME 16 Sep 2005	ME 17 Dec 2005	ME 18 March 2006	ME 19 Nov 2006	ME 20 Mar 2007
MW09-21S																				
benzene* (5)	25 24	20	20 J	23	20	18	17	20	22 J	18	15.2	16.1 J	15.9	15.2	16.6	15.6	13.2	13.7	13.9	15.2
arsenic (10)	5 U/5 U	5 UJ	**6.3 J**	4.9 U	**6.1**	**9**	**8.7**	**9.5**	**8.5 J**	**9.4 J**	**5.7**	**2.8 J**	2.2 U	**3.1 J**	**8**	6.1 U	**6.2**	16.4	3.7 U	31.2
beryllium (4)	0.48 U/0.48 U	0.48 U	0.11 U	0.11 U	1 U	0.06 U	0.02 U	**0.03 J**	**0.03 J**	0.12 U	5 U**	0.19 U	0.12 U	0.18 U	**6.2**	0.18 U	0.18 U	5.3	0.22 U	0.12 U
MW09-21D																				
benzene* (5)	**4.46**	**5**	**2 J**	**2.87**	5.03 J	**2.66**	9.69 J	**3.79**	**4.01/4.12**	8.08 8.23	**2.6/2.5**	9.6	11.3	5.4	6	7.7	**4.8**	5.8	**4.5**	**4.8**
1,1-DCE (7)	1 U	**3 J**	**2 J**	**3**	**1.86 J**	**1.62**	20 U**	32	**1.39/1.49**	**2.69/2.32**	**1.4/1.6**	**2.2**	**3.7**	5 U	**2**	3.6 U	**1.7**	**1.7**	**1.4**	**2.9**
chlorobenzene (100)	**40**	**35**	**4 J**	**5.55**	**13 J**	**4.68**	**66**	**11**	**15/17**	**88 J/48 J**	**12.9/12.5**	147	166	106	**67.2**	147	105	145 J	**96.9**	147
trichloroethene* (5)	500	320	210 J	120	330 J	160 J	210	100 J	100 99	190 230	89.1 87.7	196	300	99.8	146	166	141	154	196	181
cis-1,2-DCE* (70)	1,200	850E	740J	570	880J	380	780	550 J	740 790	780 920	461 450	725	829	625	602	697	707	617	641	599
vinyl chloride* (2)	44	44	44 J	44	110 J	120 J	50	75 J	81 85	100 110	97.6 96.2	113	234	108	171	119	92.4	161 J	132	124
MW09-23S																				
antimony (6)	1.8 UJ	36 U**	2.5 U	1.8 U	1.2 U	**2.6**	**0.42 J**	**0.53 J**	**0.48**	**1.6 J**	6.5	1.7 U	1.9 U	1.6 UJ	1.6 U	1.6 U	1.6 U	1.6 U	3.3 U	1.6 U
arsenic* (10)	5 U	100 U**	**5.6 J**	17 J	22.4	38.1	33.6	22.9	15 J	19.2 J	12.4	**2.2 J**	2.2 U	4.1 U	**4.2 J**	2.3 U	**3.5 J**	2.3 U	3.7 U	**5**
MW09-24S																				
antimony (6)	1.8 U	1.8 U	23.6	20	2 U/2 U	0.53 U	0.21 U	0.21 U	0.21 U	0.06 UJ	**4.2**	1.7 U	2.3 U	1.6 U	1.6 U	1.7 U	1.6 U	2.4 U	3.3 U	1.4 U
MW09-24D																				
antimony (6)	1.8 U	1.8 U	**5.7**	7.7 J	0.25 U	0.53 U	0.21 U	0.21 U	0.21 U	0.08 U	**4.4**	2.4 U	3.6 U	1.6 U	2.4 U	2.3 U	1.6 U	2.4 U	3.3 U	1.4 U
arsenic* (10)	15.4	5 UJ	17	21 J	**7.7**	10.6	17.3 J	25.5	29 J	11.7 J	16.6	18.5	25.1	14.9	19 J	26.4	19.1	17	15.3	15.5
MW09-25S																				
benzene* (5)	6.46	42	12	7.03	21	11	13 U**/11 U**	7.16	15	12	11.9	9.7	7.3	13.7	10.1	13.1	7.8	10.5	15.8	10.9
antimony (6)	1.8 U	1.8 U	12.8	8.7 U**	0.28 U	0.53 U	0.21 U/0.21 U	0.21 U	0.21 U	0.06 UJ	0.76 U	1.7 U	1.7 U	1.6 U	2.4 U	1.8 U	**2.2 J**	2.4 U	3.3 U	1.4 U

Notes:
* - See Appendix D for concentration trend graph
Project Action Level (PAL) = MCL, unless RIDEM GA goal is more stringent.
Black Background - Criteria Exceeded
Gray Background - Detected
U - Not Detected
UJ - Detection Limit Approximate
J - Quantitation Approximate
NA - Not Analyzed
NE - No Exceedance
E - Exceeded Instrument Calibration Range
B - Associated with Method Blank
µg/L - Micrograms Per Liter
** - indicates that the specified parameter was not detected but its DL was greater than the PAL.

TABLE 3-2

SUMMARY OF PAL EXCEEDANCES IN MONITORING WELLS -
ME 01 THROUGH ME 20 - SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND
PAGE 1 OF 2

Mon. Well	Type	Chemical	Exceed	No. Samples	Exceed %
MW09-03D	VOC	*cis*-1,2-DCE	20	20	100%
MW09-03D	VOC	TCE	14	20	70%
MW09-03D	VOC	Vinyl chloride	20	20	100%
MW09-03D	Metals	Antimony	1	20	5%
MW09-03D	Metals	Arsenic	1	20	5%
MW09-07S	**VOC**	**Benzene**	**20**	**20**	**100%**
MW09-07S	**SVOC**	**Naphthalene**	**11**	**20**	**55%**
MW09-07S	**Metals**	**Arsenic**	**19**	**20**	**95%**
MW09-08S	VOC	TCE	1	20	5%
MW09-08S	VOC	Vinyl chloride	20	20	100%
MW09-08S	Metals	Arsenic	9	20	45%
MW09-09S	**VOC**	**Benzene**	**15**	**20**	**75%**
MW09-09S	**VOC**	***cis*-1,2-DCE**	**14**	**19**	**74%**
MW09-09S	**VOC**	**Vinyl chloride**	**20**	**20**	**100%**
MW09-10S	VOC	Vinyl chloride	3	20	15%
MW09-10S	Metals	Antimony	1	20	5%
MW09-10S	Metals	Arsenic	11	20	55%
MW09-10D	**Metals**	**Arsenic**	**1**	**20**	**5%**
MW09-11S	VOC	Chlorobenzene	6	20	30%
MW09-11S	PCB	Aroclor 1260	1	20	5%
MW09-11S	Metals	Chromium	1	20	5%
MW09-11S	Metals	Nickel	1	20	5%
MW09-14D	**Metals**	**Antimony**	**2**	**20**	**10%**
MW09-20I	VOC	1,1,2-TCA	16	20	80%
MW09-20I	VOC	1,2-DCA	6	20	30%
MW09-20I	VOC	1,1-DCE	14	19	74%
MW09-20I	VOC	Benzene	7	20	35%
MW09-20I	VOC	Chloroform	4	20	20%
MW09-20I	VOC	cis-1,2-DCE	20	20	100%
MW09-20I	VOC	Methylene Chloride	9	20	45%
MW09-20I	VOC	trans-1,2-DCE	20	20	100%
MW09-20I	VOC	PCE	14	20	70%
MW09-20I	VOC	TCE	20	20	100%
MW09-20I	VOC	Vinyl chloride	18	20	90%
MW09-20I	Metals	Antimony	2	20	10%
MW09-20I	Metals	Arsenic	6	20	30%
MW09-20D	**VOC**	**TCE**	**1**	**20**	**5%**
MW09-20D	**VOC**	**Vinyl chloride**	**7**	**20**	**35%**
MW09-20D	**Metals**	**Arsenic**	**1**	**20**	**5%**
MW09-21S	VOC	Benzene	20	20	100%
MW09-21S	Metals	Arsenic	2	20	10%
MW09-21S	Metals	Beryllium	1	20	5%
MW09-21D	**VOC**	**1,1-DCE**	**1**	**20**	**5%**
MW09-21D	**VOC**	**Benzene**	**9**	**20**	**45%**
MW09-21D	VOC	Chlorobenzene	7	20	35%
MW09-21D	VOC	cis-1,2-DCE	20	20	100%

TABLE 3-2

SUMMARY OF PAL EXCEEDANCES IN MONITORING WELLS - ME 01 THROUGH ME 20 - SITE 09 - ALLEN HARBOR LANDFILL FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Mon. Well	Type	Chemical	Exceed	No. Samples	Exceed %
MW09-21D	VOC	TCE	20	20	100%
MW09-21D	VOC	Vinyl chloride	20	20	100%
MW09-23S	Metals	Antimony	1	20	5%
MW09-23S	Metals	Arsenic	8	20	40%
MW09-24S	Metals	Antimony	2	20	10%
MW09-24D	Metals	Antimony	1	20	5%
MW09-24D	Metals	Arsenic	18	20	90%
MW09-25S	VOC	Benzene	19	20	95%
MW09-25S	Metals	Antimony	1	20	5%

Notes:

1. Exceedances for bis(2-ethylhexyl)phthalate (BEHP) were excluded. BEHP is a common laboratory contaminant that has been detected infrequently during the LTMP and is not believed to be site-related.
2. VOC = volatile organic compound; SVOC = semi-volatile organic compound; PCB = polychlorinated biphenyls; DCE = dichloroethene; TCE = trichloroethene; TCA = trichloroethane; DCA = dichloroethane; PCE = tetrachloroethene.
3. No exceedances in MW09-02S or MW09-23D.
4. Values reported as ND were considered non detect even if DL was greater than the PAL.

TABLE 3-3

SUMMARY OF STATISTICAL ANALYSIS OF CHEMICAL CONCENTRATIONS - ALLEN HARBOR LANDFILL FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

MW	Chemical	PAL	# Samples	#Exceed	Method	Slope	S-Value	p-value
MW09-03D	TCE	5	20	14	LR	(0.00043)	---	0.451
MW09-03D	*cis-1,2-DCE*	*70*	*20*	*20*	*MK*	---	*(43)*	*0.102*
MW09-03D	Vinyl Chloride	2	20	20	LR	(0.0000039)	---	0.998
MW09-07S	**Benzene**	**5**	**20**	**20**	**MK**	---	**(149)**	**8.E-07**
MW09-07S	Naphthalene	20	20	11	LR	0.00012	---	0.959
MW09-07S	Arsenic	10	20	19	LR	(0.00023)	---	0.925
MW09-08S	*Vinyl Chloride*	*2*	*20*	*20*	*MK*	---	*(38)*	*0.115*
MW09-08S	Arsenic	10	20	9	LR	0.00014	---	0.939
MW09-09S	*cis-1,2-DCE*	*70*	*19*	*14*	*LR*	*0.0598*	---	*0.090*
MW09-09S	**Vinyl Chloride**	**2**	**20**	**20**	**LR**	**0.0794**	---	**0.013**
MW09-09S	**Benzene**	**5**	**20**	**15**	**LR**	**0.0013**	---	**0.011**
MW09-10S	Arsenic	10	20	11	LR	(0.0013)	---	0.559
MW09-20I	**Tetrachloroethene**	**5**	**20**	**14**	**MK**	---	**(60)**	**0.028**
MW09-20I	**TCE**	**5**	**20**	**20**	**LR**	**(66.1)**	---	**0.024**
MW09-20I	Total 1,2-DCE	70*	20	20	MK	---	(18)	0.290
MW09-20I	Vinyl Chloride	2	20	18	MK	---	5	0.448
MW09-20I	1,1,2-TCA	5	20	16	MK	---	(24)	0.228
MW09-20I	**1,1-DCE**	**7**	**19**	**14**	**MK**	---	**(48)**	**0.050**
MW09-20D	**Vinyl Chloride**	**2**	**20**	**7**	**MK**	---	**98**	**0.001**
MW09-21S	**Benzene**	**5**	**20**	**20**	**LR**	**(0.0048)**	---	**0.0001**
MW09-21D	*TCE*	*5*	*20*	*20*	*MK*	---	*(46)*	*0.072*
MW09-21D	*cis-1,2-DCE*	*70*	*20*	*20*	*LR*	*(0.121)*	---	*0.093*
MW09-21D	**Vinyl Chloride**	**2**	**20**	**20**	**LR**	**0.055**	---	**0.003**
MW09-21D	Benzene	5	20	9	LR	0.001	---	0.319
MW09-23S	**Arsenic**	**10**	**20**	**8**	**MK**	---	**(87)**	**0.003**
MW09-24D	Arsenic	10	20	18	LR	0.0031	---	0.245
MW09-25S	Benzene	5	20	19	MK	---	11	0.373
P09-08	*Total 1,2-DCE*	*NA*	*17*	*NA*	*MK*	---	*37*	*0.069*
P09-08	Vinyl Chloride	NA	17	NA	MK	---	5	0.435
P09-10	*Vinyl Chloride*	*NA*	*18*	*NA*	*MK*	---	*(28)*	*0.190*

Notes:

1. MW = Monitoring Well
2. PAL = Project Action Limit (* - PAL for cis-1,2-DCE used for total 1,2-DCE)
3. # Samples = Number of groundwater samples analyzed for this parameter during the LTMP
4. # Exceed = Number of groundwater samples with parameter exceeding PAL during LTMP
5. Method = Statistical method used to perform analysis (LR = linear regression, MK = Mann-Kendall)
6. Slope = Slope of linear regression line.
7. S-Value = S-Value from Mann-Kendall analysis.
8. p-value = Probability that concentration trend is not non-zero
9. If concentrations conform to a normal distribution with greater than 85% detects, linear regression was used to evaluate trends. Else, Mann-Kendall Test was used to evaluate trends.
10. Bold = 95% statistically significant trend
11. Italic = 80% statisticall significant trend
12. Values reported as ND were considered non detect even if the DL was greater than the PAL.

TABLE 3-4

SUMMARY OF DETECTED ANALYTES EXCEEDING PALs IN WATER SAMPLES FROM PIEZOMETERS
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND
PAGE 1 OF 2

Analyte (PAL in µg/L)	Analyte Concentration (µg/L)																			
	ME 01 Dec 2001-Jan 2002	ME 02 Feb-Mar 2002	ME 03 Jun 2002	ME 04 Sep 2002	ME 05 Jan 2003	ME 06 Apr-May 2003	ME 07 Jun-Jul 2003	ME 08 Sep 2003	ME 09 Dec 2003	ME 10 Mar 2004	ME 11 Jun 2004	ME 12 Aug 2004	ME 13 Oct 2004	ME 14 Mar 2005	ME 15 Jun 2005	ME 16 Sep 2005	ME 17 Dec 2005	ME 18 Mar 2006	ME 19 Nov 2006	ME 20 March 2007
P09-01																				
Arsenic (36)	100 U*	100 U*	4.9 UJ	4.9 U	5.2	9.2 UJ	32.5 J	21.6	36.8	5.3 U	5 U	2.8 U	2.2 U	2.3 U	2.3 UJ	2.3 U	2.3 U	2.3 U	4 J	5.2 U
Chromium (50)	29200	128 U*	1670	180 J	22.3 J	3600	3.1 J	8	9.6 U	3 U	10 U	0.26 U	0.26 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.67 U	0.24 U
Copper (2.9)	492	174 U*	160	39 U*	22 J	781 J	12.9	2.5	6.1 J	14.4 U*	1.3 U	0.47 U	0.47 U	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	1.4 U	0.79 U
Lead (8.1)	186	36 U*	81.2	17	1.7 J	830 J	0.50 U	0.88 J	0.50 UJ	0.78 U	3 U	1.5 U	1.5 U	1.9 U	1.9 U	1.9 U	1.9 U	7.2	1.5 U	1.7 U
Mercury (0.08)	0.05 U	0.08 U	0.07 U	0.26 J	0.08 UJ	0.02 U	0.04 J	0.71 J	0.02 U	0.02 U	0.20 U	0.07 U	0.07 U	0.067 U	0.34 U*	0.067 U	0.06 U	0.067 U	0.045 U	0.018 U
Nickel (8.3)	2900	146 U*	522	47 U*	18.4 J	2180 J	25.2	10.8	15.1	5.5	40 U*	2.4 J	4.5 J	8.7 J	7 J	17.6 J	10.2 J	7.6 U	11.4 J	75.4
Zinc (81)	1230	142 U*	810	64	20 J	3350 J	22.2 J	13.1 U	10.7 U	5.6 U	7 J	0.75 U	0.75 U	1.6 U	2.9 U	18.6 U	1.2 UJ	1.2 U	12.3 J	3.7 U
Total PCBs (0.03)	0.33 U*	NS	NS	0.38 U*	1.2	0.1 U*	0.1 U*	0.1 U*	0.1 U*	0.05	0.28 U*	0.041 U*	0.046 U*	0.019 U	0.041 U*	0.026 U	0.02 U	0.014	0.031	0.039 U*
P09-02																				
Arsenic (36)	50 U*	NS	14.3	4.9 U	47.5	49.4 J	56.5 J	50.5	39.7	37.2	5 U	2.2 UJ	2.2 U	2.6 J	3.6 J	2.3 U	3.5 J	4.2 U	10.8	7.9
Chromium (50)	1550	NS	916	27 J	3.2 J	5010	9.6 J	12.1	26.4	6.5 U	10 U	0.26 U	0.26 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.67 U	0.24 U
Copper (2.9)	87 U*	NS	37	17 U*	125 J	70.9 J	12.4	4.9	7 J	97.9 J	1.8 U	0.47 U	0.47 U	2.8 U	2.8 U	2.9 U	2.8 U	2.8 U	1.4 U	0.79 U
Lead (8.1)	18 U*	NS	84.3	2.6 U	0.19 J	45.4 J	0.61 J	1.7	0.50 UJ	0.78 U	1.4 U	2.9 U	2.9 U	5.7 U	3.8 U	3.8 U	1.9 U	2.2 J	1.5 U	1.7 U
Mercury (0.08)	0.05 U	NS	0.07 U	0.31 J	0.30 UJ*	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.20 U*	0.07 U	0.07 U	0.067 U	0.067 U	0.067 U	0.10 J	0.067 U	0.045 U	0.018 U
Nickel (8.3)	585	NS	543	14 U*	11.1 J	2230 J	21.7	19	11.9	14.3	40 U*	0.61 U	0.61 U	0.65 U	0.65 U	6.8 J	0.65 U	0.65 U	0.81 UJ	1.3 U
Zinc (81)	71 U	NS	250	20 U*	12.5 J	543 J	11.3 J	12.7 U	10.2 U	9 U	4.5 J	0.75 U	0.75 U	1.2 U	1.2 UJ	1.2 U	2.4 UJ	1.2 U	0.80 U	1.1 U
Total PCBs (0.03)	NS	NS	0.25 U*	0.20 U*	0.20 U*	0.10 U*	0.10 U*	0.10 U*	0.10 U*	0.10 U*	0.31 U*	0.041 U*	0.046 U*	0.046 U*	0.047 U*	0.024 U	0.04	0.016	0.028 U	0.044 U*
P09-03																				
Arsenic (36)	5 U	NS	R	4.9 U	14.7	43 J	53.3 J	51.6	43.2	36	5 U	2.9 U	3 U	4.2 J	4.9 J	2.7 J	4.1 J	4.4 U	7.7	18.8
Chromium (50)	67.7	NS	988	60 J	1160 J	485	8.7 J	12	20.6	7.3 U	10 U	0.26 U	0.26 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.67 U	0.24 U
Copper (2.9)	21.4	NS	5.9 U*	23 U*	110 J	114 J	10	6.9	9.3 J	207 J	1.4 U	0.47 U	0.47 U	2.8 U	2.8 U	2.3 U	2.8 U	2.8 U	1.4 U	0.79 U
Lead (8.1)	10.2 J	NS	275	17	137 J	74.8 J	0.54 J	1.6	0.50 UJ	0.78 U	1.7 U	2.9 U	2.9 U	5.7 U	3.8 U	3.3 U	3.8 U	2.1 J	1.5 U	1.7 U
Mercury (0.08)	0.05 U	NS	0.07 U	0.40 J	0.06 UJ	0.02 U	0.02 U	0.03 J	0.02 U	0.02 U	0.20 U*	0.07 U	0.07 U	0.067 U	0.067 U	0.067 U	0.06 U	0.067 U	0.045 U	0.018 U
Nickel (8.3)	41.9	NS	536	53 U*	468 J	268 J	16.4	15.5	17.5	22.2	40 U*	1.5 J	0.61 U	1.7 U	1.1 U	1.5 U	0.65 U	0.65 U	1.9 J	18.3 J
Zinc (81)	11.1 J	NS	1600	56	346 J	448 J	8.7 J	17.5 U	18 U	8.8 U	20 U	0.75 U	0.75 U	1.2 U	1.2 UJ	1.2 U	2.4 UJ	1.2 U	0.80 U	1.1 U
P09-04																				
Arsenic (36)	5 U	100 U*	4.9 U	8 U	18.5	52.5 J	48.4 J	54.9	37.9	29.8	5 U	5.1 U	2.2 U	3.2 J	7 J	2.5 J	4.9 J	2.5 U	9	6.8
Chromium (50)	17.7	177	640	38 J	242 J	269	5.9 J	11.7	20.8	6.4 U	10 U	0.26 U	1.6 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.67 U	0.24 U
Copper (2.9)	19.3	174 U*	5.9 U*	46 U*	314 J	79.2 J	15.2	7.3	9.7 J	296 J	25 U*	0.47 U	0.47 U	2.8 U	2.8 U	2.3 U	2.8 U	2.8 U	1.4 U	0.79 U
Lead (8.1)	R	36 U*	2.6 U	10	229 J	32.7 J	0.50 U	1.5	0.50 UJ	0.78 U	1.9 U	2.9 U	2.9 U	5.7 U	3.8 U	3.5 U	3.8 U	2.8 J	1.5 U	1.7 U
Mercury (0.08)	0.06 U	0.08 U	0.07 U	0.41 J	1.1 J	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.20 U*	0.07 U	0.07 U	0.067 U	0.072 U	0.067 U	0.06 U	0.067 U	0.057 J	0.018 U
Nickel (8.3)	16	146 U*	267	65	200 J	166 J	13	16.2	19	13	40 U*	0.61 U	0.61 U	0.65 U	0.65 U	0.66 U	3.3 J	0.65 U	11.1 J	1570
Zinc (81)	7.1 U	142 U*	6.8 U	33	307 J	144 J	8.6 J	14.6 U	13.8 U	8.2 U	5.9 J	0.75 U	0.75 U	1.2 U	1.2 UJ	1.2 U	2.4 U	1.2 U	0.80 U	1.6 U
P09-05																				
Arsenic (36)	100 U*	NS	4.9 U	11 U	40.6	49.8 J	48.6 J	52.9	43.2	37.2	5.3	6.9 U	2.2 U	6.5	3.4 J	5.4	4.4 J	6.5 U	11.6	11.7
Chromium (50)	300	NS	619	290 J	268 J	2440	6.6 J	11.9	13 U	6.4 U	10 U	0.26 U	0.26 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.67 U	0.24 U
Copper (2.9)	174 U*	NS	160	120	168 J	102 J	8.8	10.6	12.1 J	480 J	25 U*	0.47 U	0.47 U	2.8 U	2.8 U	2.3 U	2.8 U	2.8 U	1.4 U	0.79 U
Lead (8.1)	84.1	NS	29.3	57	16.3 J	123 J	0.50 U	1.5	0.50 UJ	0.78 U	3 U	2.9 U	2.9 U	5.7 U	3.8 U	3.3 U	1.9 U	2.3 J	1.5 U	1.7 U
Mercury (0.08)	0.06 U	NS	0.07 U	0.51 J	0.12 UJ*	0.02 U	0.02 U	0.12 J	0.02 U	0.02 U	0.20 U*	0.07 U	0.07 U	0.067 U	0.067 U	0.067 U	0.10 J	0.067 U	0.045 U	0.018 U
Nickel (8.3)	153	NS	327	280	142 J	1100 J	13	15.4	12.7	30.4	4.7 U	0.67 J	0.61 U	4.1 U	0.65 U	4.7 J	0.65 U	0.65 U	0.81 UJ	0.70 U
Zinc (81)	267	NS	550	260	70.7 J	518 J	6.9 J	42 J	12.1 U	9.8 U	3.8 J	0.75 U	0.75 U	1.2 U	1.2 UJ	1.2 U	1.2 UJ	1.2 U	0.80 U	1.1 U

BLACK BACKGROUND - CRITERIA EXCEEDED U - NOT DETECTED, UJ - DETECTION LIMIT APPROX.
J - QUANTITATION APPROX R - REJECTED NA - NOT ANALYZED NE - NO EXCEEDANCE DL - DETECTION LIMIT B - ASSOCIATED WITH METHOD BLANK

TABLE 3-4

SUMMARY OF DETECTED ANALYTES EXCEEDING
PALs IN WATER SAMPLES FROM PIEZOMETERS
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND
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Analyte (PAL in µg/L)	Analyte Concentration (µg/L)																			
	ME 01 Dec 2001-Jan 2002	ME 02 Feb-Mar 2002	ME 03 Jun 2002	ME 04 Sep 2002	ME 05 Jan 2003	ME 06 Apr-May 2003	ME 07 Jun-Jul 2003	ME 08 Sep 2003	ME 09 Dec 2003	ME 10 Mar 2004	ME 11 Jun 2004	ME 12 Aug 2004	ME 13 Oct 2004	ME 14 Mar 2005	ME 15 Jun 2005	ME 16 Sep 2005	ME 17 Dec 2005	ME 18 Mar 2006	ME 19 Nov 2006	ME 20 March 2007
P09-06																				
Arsenic (36)	50 U*	NS	4.9 U	4.9 U	19.9	70.8 J	57.6 J	53.1	43.4	37	**3.9 J**	2.4 U	5.8 U	**16.6**	**4.4 J**	7.2	**4.1 J**	8.4 U	**15.6**	**8.9**
Chromium (50)	1400	NS	978	300 J	1330 J	1070	**5.1 J**	**12.2**	12.2 U	6.7 U	10 U	0.26 U	0.26 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.67 U	0.24 U
Copper (2.9)	87 U*	NS	5.9 U*	89	338 J	376 J	12.1	9.7	12.7 J	523 J	2 U	0.47 U	0.47 U	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	1.4 U	0.79 U
Lead (8.1)	158	NS	2.6 U	24	54.5 J	169 J	0.50 U	1.4	0.50 UJ	0.78 U	3 U	2.9 U	2.9 U	5.7 U	3.8 U	3.8 U	1.9 U	1.9 U	1.5 UJ	1.7 U
Mercury (0.08)	0.05 U	NS	0.07 U	0.21 U*	0.08 UJ	0.02 U	0.02 U	0.15 J	0.02 U	0.02 U	0.20 U*	0.07 U	0.07 U	0.072 U	0.067 U	0.067 U	0.08 J	0.067 U	0.045 U	0.03 U
Nickel (8.3)	800	NS	494	210	618 J	729 J	14.7	14.5	12.6	18.2	4.4 U	0.61 U	0.61 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.81 U	5.6 U
Zinc (81)	602	NS	150	610	231 J	616 J	**7.1 J**	26.1 U	10.4 U	9.5 U	**1.7 J**	0.75 U	0.75 U	1.2 U	1.2 UJ	1.2 U	1.2 U	1.2 U	0.80 U	1.6 U
Trichloroethene	1 U	NS	NS	1 U	990 J	1 U	1 U	1 U	1 U	1 UJ	2 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.26 U	0.26 U	0.74 U	0.30 U
cis-1,2-DCE	1 U	NS	NS	1 U	130 J	1 U	1 U	1 U	1 U	**0.43 J**	2 U	1.2 U	1.2 U	1.2 U	1 U	1 U	0.70 U	0.70 U	1 U	0.36 U
Vinyl chloride	1 U	NS	NS	1 U	0.91 J	1 UJ	1 U	1 U	1 U	1 U	2 U	0.49 U	0.49 U	0.49 U	0.49 U	0.49 U	0.83 U	0.83 U	1 U	0.24 U
P09-07																				
Arsenic (36)	25 U	100 U*	14.1	4.9 U	45.3	**30.8 J**	50.9 J	53.2	42.6	**35.9 J**	**4.7 J**	2.6 U	3.7 U	**10.4**	**3 J**	**2.4 J**	**7.9**	5.2 U	**12.7**	**11**
Chromium (50)	32 U	128 U*	2140	1700 J	2.4 J	5270	**4.7 J**	**12.3**	10.7 U	6.6 U	0.86 U	0.26 U	0.26 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.67 U	0.24 U
Copper (2.9)	43.5 U*	174 U*	52	81	213 J	1080 J	10	11.1	8.6 J	422 J	1.2 U	0.47 U	0.47 U	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	1.4 U	0.79 U
Lead (8.1)	9 U*	36 U*	70.8	34	0.44 J	840 J	0.50 U	**1.5**	0.50 UJ	0.78 U	3 U	2.9 U	2.9 U	5.7 U	3.8 U	3.8 U	3.8 U	**3 J**	1.5 UJ	1.7 U
Mercury (0.08)	0.06 U	0.08 U	NS	0.42 J	0.30 UJ*	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.20 U*	0.07 U	0.07 U	0.067 U	0.093 U*	0.067 U	0.06 UJ	0.067 U	0.045 U	0.018 U
Nickel (8.3)	36.5 U*	146 U*	1250	990	12.9 J	3050 J	13.6	17.1	22.3	19.7 J	9.2 J	**2 J**	0.61 U	0.95 U	0.65 U	0.65 U	**1.2 J**	0.65 U	0.81 U	0.70 U
Zinc (81)	35.5 U	142 U*	380	150	11.5 J	4140 J	**7 J**	18.3 U	10.7 U	8.9 U	**1.2 J**	0.75 U	0.75 U	1.2 U	1.2 UJ	1.2 U	2.4 U	1.2 U	0.80 U	1.1 U
Total PCBs (0.03)	NS	NS	NS	NS	0.20 U*	0.10 U*	0.10 U*	0.10 U*	0.10 U*	0.10 U*	0.25 U*	0.041 U*	0.051 U*	0.043 U*	0.042 U*	0.025 U	0.05	**0.014**	0.031 U*	0.039 U*
P09-08																				
Arsenic (36)	100 U*	NS	4.9 U	32 U	36.1/40.3	44.9 J/44.3 J	54.7 J/47.5 J	45.8/49	39.7/41.9	**30.3/32.8**	8.7 J/5 U	2.2 UJ/2.2 UJ	10 U/10 U	**4.3 J/5.4**	2.3 UJ/2.3 UJ	4.2 J/2.3 U	3.3 U/2.3 U	**2.3 U/3.4 J**	**10.2/6.8**	**12.8/9**
Chromium (50)	168	NS	.53 U	430 J	231 J/16 J	**13.4 J/7.9 J**	**5 J/7.5 J**	**13.4/13.2**	10.9 U/10.9 U	8 U/6.7 U	25 U/1.3 U	26 U/.26 U	26 U/.26 U	0.53 U/0.53 U	0.53 U/0.53 U	0.53 U/0.53 U	**0.53 UJ/2 J**	0.53 U/0.53 U	.67 U/.67 U	.24 U/.24 U
Copper (2.9)	206	NS	71	320	148 J/110 J	6.3 J/8 J	13.3/13.3	11.6/9.3	6.2 J/7.2 J	257 J/318 J	25 U*/25 U*	0.47 U/0.47 U	0.47 U/0.47 U	2.8 U/2.8 U	2.8 U/2.8 U	2.8 U/2.8 U	2.8 U/2.8 U	2.8 U/2.8 U	1.4 U/1.4 U	0.79 U/0.79 U
Lead (8.1)	9.3	NS	2.6 U	170	12 J/4.2 J	1.5 UJ/1.5 UJ	0.50 U/0.50 U	**1.3/1.1**	0.55 J/0.50 UJ	0.78 U/0.78 U	2 U/0.45 J	2.9 U/2.9 U	2.9 U/2.9 U	5.7 U/9.5 U*	1.9 U/3.8 U	1.9 U/3.8 U	1.9 U/1.9 U	4.9 U/3.5 U	1.5 U/1.5 UJ	1.7 U/1.7 U
Mercury (0.08)	1.4	NS	0.07 U	NS (P09-08A)	0.085 UJ*/0.3 UJ	0.02 U/0.02 U	0.02 U/0.02 U	0.02 U/0.02 U	0.02 U/0.02 U	0.02 U/0.02 U	0.02 U/0.02 U	0.07 U/0.07 U	0.07 U/0.07 U	0.067 U/0.067 U	0.067 U/0.092 U	0.067 U/0.067 U	0.06 U/0.06 UJ	0.067 U/0.067 U	**0.045 UJ/0.045 U**	0.018 U/0.018 U
Nickel (8.3)	197	NS	12.1	950	89.4 J/24.4 J	15.9 J/14.3 J	4.1/12.7	13/13.7 J	11.9/11.9	15.9/15.4	25 U*/40 U*	0.61 U/0.61 U	0.61 U/0.61 U	0.65 U/0.65 U	0.65 U/0.65 U	0.65 U/0.65 U	0.65 U/0.65 U	0.65 U/0.65 U	1.3 J/0.81 U	0.70 U/0.70 U
Zinc (81)	409	NS	650	590	**38.9 J/15.5 J**	**57.7 J/56.4 J**	**12.7 J/13.7 J**	16 U/17.7 U	11.7 U/12 U	9.2 U/9.5 U	25 U/4.5 J	0.75 U/0.75 U	0.75 U/0.75 U	1.2 U/1.2 U	1.2 UJ/6.2 U	1.2 U/1.2 U	1.2 U/1.2 U	1.2 U/1.2 U	0.80 U/0.80 U	1.1 U/1.1 U
Trichloroethene	NS	NS	NS	**34**	1 UJ/1 U	**0.32 J/0.15 J**	1 U/1 U	0.12 J/1 UJ	1 U/1 U	**0.32 J/0.20 J**	2 U/2 U	0.49 U/0.49 U	0.49 U/0.49 U	0.49 U/0.49 U	2.4 U/2.4 UJ	0.49 U/0.49 U	0.26 U/0.26 U	0.26 U/0.26 U	0.74 U	0.30 U/0.30 U
cis-1,2-DCE	NS	NS	NS	**170**	**0.93 J/1.09 J**	**8.64 J/3.35 J**	0.61 J/1 U	1 U/1 U	**1 UJ/0.27 J**	**360/340**	**231/284**	**115/112**	**27.2/23.6**	**244 J/346 J**	**256 J/211**	**9.7 J/13.6 J**	**37.8 J/13.8 J**	**311 J/150 J**	1 U	**22.8/22.5**
Vinyl chloride	NS	NS	NS	**5.84 J**	**0.88 J/0.84 J**	**11 J/6.87 J**	**11 J/2.73 J**	1 U/1 U	1 U/1 U	**1100/1100**	**460/1000**	**526 J/455 J**	**334/281**	**1900 J/1160 J**	**1410 J/1010 J**	**38.9 J/112 J**	**308 J/210 J**	**1780 J/1230 J**	**7.1**	**41.1/32.7**
P09-09																				
Arsenic (36)	5 U	NS	4.9 U	4.9 U	13.9	**10.8 J**	**9.4 J**	**12.2**	4.3 U	**9.6**	5 U	2.2 UJ	2.2 U	2.3 U	2.3 UJ	2.3 U	2.3 U	**3.5 J**	**7**	1.3 U
Chromium (50)	**7 J**	NS	**38.6**	0.53 UJ	126 J	**34**	**2.2 J**	**8.6**	15.7 U	8.4 U	10 U	0.26 U	0.32 U	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U	0.67 U	0.77 U
Copper (2.9)	8.7 U*	NS	5.9 U*	15 U*	146 J	74.2 J	14.6	**2.2**	**0.66 J**	56.9 U*	25 U*	4 U*	0.49 U	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	1.4 U	0.79 U
Lead (8.1)	**2.3 J**	NS	105	2.6 U	150 J	69.6 J	0.50 U	0.50 U	0.50 UJ	0.78 U	3.6 U	1.5 U	1.5 U	1.9 U	1.9 U	1.9 U	1.9 U	3.2 U	1.5 UJ	1.7 U
Mercury (0.08)	0.05 U	NS	0.07 U	0.36 J	0.37 J	0.02 U	**0.05 J**	0.02 U	0.02 U	0.02 U	0.20 U	0.07 U	0.07 U	0.067 U	0.067 U	0.067 U	0.20 U	0.067 U	0.045 U	0.028 U
Nickel (8.3)	14.1 J	NS	81.8	5 U	141 J	82.5 J	16.3	**6.4**	**62.5 J**	35.5	**7.7 J**	**4.7 J**	622	17.4 J	2 U	1.2 U	19.2 J	108	0.81 U	12 J
Zinc (81)	18.5	NS	3.2 U	3.2 U	304 J	222 J	**8.3 J**	5.9 U	2 U	10.2 U	**14.2 J**	13 U	5.5 U	5.1 U	1.2 UJ	11.5 U	1.2 U	1.2 U	0.80 U	12.4 U
Total PCBs (0.03)	NS	NS	NS	0.20 U*	0.29 U*	0.10 U*	0.10 U*	0.10 U*	0.10 U*	0.10 U*	0.42 U*	0.041 U*	0.051 U*	0.048 U*	0.079 U*	0.08	0.05 U*	0.039 U*	0.93	0.048 U*
P09-10																				
Arsenic (36)	188	NS	**8.3 J**	4.9 U	2 U	1.8 UJ	**3.6 J**	0.57 U	1 U	0.92 U	10 U	2.2 UJ	2.2 U	**2.7 J**	2.3 UJ	2.3 UJ	2.8 U	2.3 U	**5.6**	1.3 U
Chromium (50)	1230	NS	285	2.6 UJ	**22.5 J**	2.1 UJ	**1.7 J**	**6.4**	14.1 U	5.9 U	**4.1 J**	0.26 U	0.76 U	0.53 U	0.53 U	0.64 U	**5.6 J**	0.53 U	0.67 U	0.71 U
Copper (2.9)	1400	NS	46	11 U*	9.9 J	3.8 UJ*	5.3	0.47 U	**0.40 J**	15.2 U*	25 U*	0.47 U	0.47 U	2.8 U	2.8 U	2.8 U	2.8 U	2.8 U	1.4 U	0.79 U
Lead (8.1)	560	NS	86.8	9.7	**2.7 J**	1.5 UJ	0.50 U	0.50 U	0.50 UJ	0.78 U	2.5 U	1.5 U	1.5 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.5 UJ	1.7 U
Mercury (0.08)	0.74	NS	0.08 J	0.19 U*	0.27 UJ*	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.20 U	0.07 U	0.07 U	0.067 U	0.067 U	0.067 U	0.06 U	0.067 U	0.045 U	0.02 U
Nickel (8.3)	3050	NS	183	7.5 U	17.5 J	**4.7 J**	**3.3 J**	**2.8**	**2.7 J**	4.7	**1 J**	**1.2 J**	2.3 U	14.5 J	25.6 J	**5.7 J**	1890	**7 J**	13.9 J	**2.3 J**
Zinc (81)	1320	NS	240	23 U	**26.7 J**	19.7 J	**10.3 J**	11.6 U	2.7 U	7.7 U	25 U	12.9 U	7.2 U	1.2 U	6 U	7 U	3 U	**2.4 J**	4.9 U	**11.2 J**
Trichloroethene	NS	NS	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 UJ	2 U	0.49 U	0.49 U	0.49 U	0.49 UJ	0.49 U	0.26 U	0.26 U	0.74 U	0.30 U
cis-1,2-DCE	NS	NS	1 U	1 U	1 U	**0.14 J**	1 U	1 U	**0.20 J**	1 U	2 U	1.2 U	1.2 U	1.2 U	1 UJ	1 U	0.70 U	0.70 U	1 U	0.36 U
Vinyl chloride	NS	NS	**5 J**	**3.99**	**8.72**	**27 J**	**14**	**15**	**35**	**5.47**	**4.9**	**6.1**	**6.7**	**2.1**	**6.7 J**	**3**	**9.5**	**4.2**	**9.6**	**1**
Total PCBs (0.03)	NS	NS	0.10 U*	0.20 U*	0.20 U*	0.10 U*	0.10 U*	0.10 U*	0.10 U*	0.10 U*	0.26 U*	0.041 U*	0.041 U*	NS	0.19	0.14	0.03	0.005 U	0.031 U*	0.039 U*

Notes: PAL = Project Action Limit (AWQC, September 1999), except for copper, mercury, and nickel which are based on site-specific study (SAIC, 1998).
* = indicates that the specified parameter was not detected but its DL was greater than the PAL

BLACK BACKGROUND - CRITERIA EXCEEDED, U - NOT DETECTED, UJ - DETECTION LIMIT APPROX.
J - QUANTITATION APPROX, R - REJECTED, NA - NOT ANALYZED, NE - NO EXCEEDANCE, DL - DETECTION LIMIT, B - ASSOCIATED WITH METHOD BLANK

TABLE 3-5

SUMMARY OF CHEMICALS EXCEEDING PROJECT ACTION LIMITS
IN PIEZOMETERS - SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Piezometer	Type	Chemical	Exceed	No. Samples	Exceed %	Piezometer	Type	Chemical	Exceed	No. Samples	Exceed %
P09-01	Metals	Arsenic	1	20	5%	P09-06	Metals	Arsenic	5	19	26%
	Metals	Chromium	4	20	20%		Metals	Chromium	5	19	26%
	Metals	Copper	6	20	30%		Metals	Copper	7	19	37%
	Metals	Lead	4	20	20%		Metals	Lead	4	19	21%
	Metals	Mercury	2	20	10%		Metals	Mercury	2	19	11%
	Metals	Nickel	12	20	60%		Metals	Nickel	9	19	47%
	Metals	Zinc	3	20	15%		Metals	Zinc	5	19	26%
	PCB	Total Aroclors	2	18	11%	P09-07	Metals	Arsenic	4	20	20%
P09-02	Metals	Arsenic	6	19	32%		Metals	Chromium	3	20	15%
	Metals	Chromium	3	19	16%		Metals	Copper	8	20	40%
	Metals	Copper	7	19	37%		Metals	Lead	3	20	15%
	Metals	Lead	6	19	32%		Metals	Mercury	1	20	5%
	Metals	Mercury	2	19	11%		Metals	Nickel	9	20	45%
	Metals	Nickel	8	19	42%		Metals	Zinc	3	20	15%
	Metals	Zinc	2	19	11%		PCB	Total Aroclors	1	16	6%
	PCB	Total Aroclors	1	18	6%	P09-08	Metals	Arsenic	5	19	26%
P09-03	Metals	Arsenic	3	19	16%		Metals	Chromium	3	19	16%
	Metals	Chromium	5	19	26%		Metals	Copper	9	19	47%
	Metals	Copper	7	19	37%		Metals	Lead	3	19	16%
	Metals	Lead	5	19	26%		Metals	Mercury	1	19	5%
	Metals	Mercury	1	19	5%		Metals	Nickel	9	19	47%
	Metals	Nickel	9	19	47%		Metals	Zinc	3	19	16%
	Metals	Zinc	3	19	16%	P09-09	Metals	Chromium	1	19	5%
P09-04	Metals	Arsenic	4	20	20%		Metals	Copper	3	19	16%
	Metals	Chromium	4	20	20%		Metals	Lead	3	19	16%
	Metals	Copper	7	20	35%		Metals	Mercury	2	19	11%
	Metals	Lead	3	20	15%		Metals	Nickel	11	19	58%
	Metals	Mercury	2	20	10%		Metals	Zinc	2	19	11%
	Metals	Nickel	11	20	55%		PCB	Total Aroclors	2	17	12%
	Metals	Zinc	2	20	10%	P09-10	Metals	Arsenic	1	19	5%
P09-05	Metals	Arsenic	6	19	32%		Metals	Chromium	2	19	11%
	Metals	Chromium	5	19	26%		Metals	Copper	4	19	21%
	Metals	Copper	8	19	42%		Metals	Lead	3	19	16%
	Metals	Lead	5	19	26%		Metals	Mercury	2	19	11%
	Metals	Mercury	3	19	16%		Metals	Nickel	7	19	37%
	Metals	Nickel	9	19	47%		Metals	Zinc	2	19	11%
	Metals	Zinc	5	19	26%		PCB	Total Aroclors	3	17	18%

TABLE 3-6

SUMMARY OF DETECTED ANALYTES EXCEEDING PALs IN
SEDIMENT SAMPLES - SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND
PAGE 1 OF 2

Analytes (PAL µg/kg)	ME 01 Dec 2001/ Jan 2002	ME 02 Feb-Mar 2002	ME 03 Jun 2002	ME 04 Sep 2002	ME 05 Jan 2003	ME 06 Apr-May 2003	ME 07 Jun-Jul 2003	ME 08 Sep 2003	ME 09 Dec 2003	ME 10 Mar 2004	ME 11 Jun 2004	ME 12 Aug 2004	ME 13 Oct 2004	ME 14 Mar 2005
SED09-01														
4,4'-DDD (20)	17	4.2 U	4.6 U	5 U	4.4 U	4.2 U	4.9 U	4.2 U	4.6 UJ	4.3 U	4.4 U	1.7 UJ	2.2 J	0.99 U
4,4'-DDT (6)	62 J	4.2 U	4.6 U	5 U	4.4 U	4.2 U	4.9 U	4.2 U	4.6 UJ	4.3 U	R	2 UJ	0.92 UJ	0.97 U
Total Aroclor (215)	1600	220	140	910	97	49	350	62	270	110	55.5	152	195	265
SED09-06														
4,4'-DDT (6)	3.9 UJ	4.1 U	4.1 U	4.2 U	4.2 U	4.2 U	4 U	4.2 U/3.9 U	4.1 UJ	4.1 U	3.9 UJ/4.1 UJ	2.1 J	7 J	0.93 U
SED09-07														
4,4'-DDT (6)	4.2 U	4.1 U	4.1 U	4.2 U/4.2 U	4.4 U	4.2 U	4.1 U	9.5	4.3 U	4.1 U	4.1 UJ	1.8 UJ	0.88 UJ	0.87 U
SED09-09														
Dibenzo(a,h)anthracene (260)	7 U	6.4 J	6.2 U	R	14 U	6.2 UJ	6.8 UJ/6.4 UJ	6.3 UJ	6.2 UJ	6.3 UJ	14 U	1.1 UJ	1.2 U	286 J
4,4'-DDE (7.65)	6.9 U	6.7 J	9.5	6.3 U	12 J	6.1 U	6.8 U/6.2 U	6.1 U	6.1 UJ	8.3	4.7 U	1.9 UJ	8.4 J	4.8 J
4,4'-DDT (6)	6.9 U	6.1 U	6.2 U	6.3 U	7 U	6.1 U	6.8 U/6.2 U	6.1 U	6.1 UJ	6.2 U	4.7 UJ	2.7 UJ	1.2 UJ	1.4 U
Total Aroclor (215)	150	120	190	170	450	160	140/170	140	130	170	53.6	29	270	382.4
SED09-10														
Anthracene (1,100)	2.1 U	2.9 J	74 J	3300 J	200 J	89 J	48 J	49 J	230 J	23 J	110 U	52.6 J	1.4 U	62.1 J
Benzo(a)anthracene (1,600)	2.1 U	14 J	190 J	5700 J	520	180 J	99 J	130 J	410 J	62 J	28.8	139	0.57 U	0.63 U
Benzo(a)pyrene (1,600)	2.1 U	12 J	130 J	3300 J	460	150 J	66 J	150 J	300 J	92 J	39.5	146	1.9 U	16.4 J
Chrysene (2,800)	2.1 U	12 J	59 J	6300 J	560	170 J	120 J	140 J	370 J	66 J	20.9 J	134	0.77 U	0.84 U
Dibenzo(a,h)anthracene (260)	4.3 U	4.9 UJ	52 U	R	49 U	24 UJ	10 UJ	5.4 UJ	4.8 UJ	6.3 UJ	16 U	41.5 J	0.96 U	340 J
Fluoranthene (5,100)	4.3 U	27 J	440 J	16000 J	1400	490 J	320 J	380 J	1100 J	140 J	48	507	64.8	622
Fluorene (540)	4.3 U	4.9 UJ	46 J	2500 J	91	55 J	26 J	36 J	200 J	11 J	110 U	0.59 UJ	0.57 U	0.63 U
Phenanthrene (1,500)	2.1 U	14 J	350 J	18570 J	830	360 J	250 J	190 J	1000 J	92 J	31.4 J	418	398	753
Pyrene (2,600)	2.1 U	21 J	350 J	12190 J	1200	410 J	290 J	430 J	920 J	120 J	49.1	343	3.5 U	918 J
Total PAH (44,792)	2.1 U	151.1	1990	77260	6701	2232	1504	1948	7150	902	249.3	2135.8	516	3151.3
Acenaphthene (500)	21 U	25 UJ	260 U	R	250 U	120 UJ	50 UJ	27 UJ	540 J	32 U	110 U	65.7 J	2.2 U	2.8 J
2-Methylnaphthalene (670)	21 U	25 UJ	260 U	R	250 U	120 U	50 UJ	27 UJ	1000 J	32 U	110 U	2 UJ	8.4 J	38.3 J

TABLE 3-6

SUMMARY OF DETECTED ANALYTES EXCEEDING PALs IN
SEDIMENT SAMPLES - SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND
PAGE 2 OF 2

Analytes (PAL µg/kg)	ME 15 Jun 2005	ME 16 Sep 2005	ME 17 Dec 2005	ME 18 Mar 2006	ME 19 Nov 2006	ME 20 Mar 2007
SED09-01						
4,4'-DDD (20)	1 U	1.4 UJ	1.3 UJ	21.5 J	0.68 UJ	0.88 U
4,4'-DDT (6)	1 UJ	1.2 UJ	1.1 UJ	1.2 U	0.57 U	1.1 U
Total Aroclor (215)	298	451.8	458	647	582.1	57.3
SED09-06						
4,4'-DDT (6)	0.89 UJ	1 U	0.96 UJ	0.94 U	0.48 U	1 UJ
SED09-07						
4,4'-DDT (6)	0.85 UJ	0.97 U	0.99 UJ	1 U	2 J	1 UJ
SED09-09						
Dibenzo(a,h)anthracene (260)	1.2 U	21.5 J	5.2 U	25.6 J	16.1 J	4.8 U
4,4'-DDE (7.65)	1.3 U	1.6 U	7.4 J	2.9 J	1.2 J	1.6 UJ
4,4'-DDT (6)	1.3 UJ	1.4 U	68.8 J	1.4 U	0.71 U	1.4 UJ
Total Aroclor (215)	211.8	115.5	114.3	145	187.1	33.3
SED09-10						
Anthracene (1,100)	25.7 J	1.6 U	4.9 U	83.7 J	62.4 J	2.9 U
Benzo(a)anthracene (1,600)	135	274	482	183	415	7 J
Benzo(a)pyrene (1,600)	197	2.1 U	820 J	303 J	29.1 J	2.9 U
Chrysene (2,800)	89.8 J	0.86 U	391	194	407	3.8 J
Dibenzo(a,h)anthracene (260)	11.8 J	1.1 U	120 J	7.8 J	4.4 U	39.6 J
Fluoranthene (5,100)	469	750	1320	637	147	34.6 J
Fluorene (540)	0.58 U	1030	0.81 U	0.61 U	103	9.8 J
Phenanthrene (1,500)	165	540	37.6 J	467	23.2 U	591
Pyrene (2,600)	289	751	2310	1090	89.8 J	78.3 J
Total PAH (44,792)	1623.1	3430.7	6811.3	3620.2	1838.9	1552.3
Acenaphthene (500)	2.2 U	2.5 U	5.2 U	91.4 J	135	11.4 J
2-Methylnaphthalene (670)	1.9 U	2.1 U	104 J	21.3 J	83.6 J	10.3 J

Notes:
Black Background = Criteria Exceeded
Gray = Detected
U = Not Detected; J = Quantitation Approximate
PAL = Project Action Level (Effects Range Median, September 1999); except for zinc, total PCBs, and 4,4-DDE which are based on site-specific study (SAIC, 1998)

TABLE 3-7

SUMMARY OF PAL EXCEEDANCES IN SEDIMENT - ME 01 THROUGH ME 20 - SITE 09 - ALLEN HARBOR LANDFILL FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Sample ID	Type	Chemical	Exceed	No. Samples	Exceed %
SED09-01	Pesticide	4,4'-DDD	1	20	5%
SED09-01	Pesticide	4,4'-DDT	1	20	5%
SED09-01	PCB	Total Aroclor	11	20	55%
SED09-06	Pesticide	4,4'-DDT	1	20	5%
SED09-07	Pesticide	4,4'-DDT	1	20	5%
SED09-09	PAH	Dibenzo(a,h)anthracene	1	20	5%
SED09-09	Pesticide	4,4'-DDE	4	20	20%
SED09-09	Pesticide	4,4'-DDT	1	20	5%
SED09-09	PCB	Total Aroclor	3	20	15%
SED09-10	PAH	Anthracene	1	20	5%
SED09-10	PAH	Benzo(a)anthracene	1	20	5%
SED09-10	PAH	Benzo(a)pyrene	1	20	5%
SED09-10	PAH	Crysene	1	20	5%
SED09-10	PAH	Dibenzo(a,h)anthracene	1	20	5%
SED09-10	PAH	Fluroanthene	1	20	5%
SED09-10	PAH	Flourene	2	20	10%
SED09-10	PAH	Phenathrene	1	20	5%
SED09-10	PAH	Prene	1	20	5%
SED09-10	PAH	Total PAH	1	20	5%
SED09-10	PAH	Acenaphthene	1	20	5%
SED09-10	PAH	2-Methylnaphthalene	1	20	5%

TABLE 3-8

COMPARISON OF GROUNDWATER MONITORING CRITERIA
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND
PAGE 1 OF 2

Chemical	Federal MCLs and/or RIDEM GQS (2002)[1]	Federal MCLs and/or RIDEM GQS (2007)[2]
VOLATILE ORGANIC COMPOUNDS (ug/L)		
VINYL CHLORIDE	2	2
1,1-DICHLOROETHENE	7	7
CHLOROBENZENE	100	100
BROMOFORM	80	80
CHLOROFORM	80	80
BROMODICLOROMETHANE	80	80
DIBROMOCLOROMETHANE	80	80
1,2-DICHLOROETHANE	5	5
BENZENE	5	5
ETHYLBENZENE	700	700
TOLUENE	1000	1000
XYLENES	10000	10000
STYRENE	100	100
TRICHLOROETHENE	5	5
TOTAL 1,2-DICHLOROETHENE	70	70
1,1,2-TRICHLOROETHANE	5	5
TETRACHLOROETHENE	5	5
1,1,2,2-TETRACHLOROETHANE	NA	NA
SEMIVOLATILE ORGANIC COMPOUNDS (ug/L)		
1,2,4-TRICHLOROBENZENE	70	70
BENZO(A)PYRENE	0.2	0.2
NAPHTHALENE	20	20
BIS(2-ETHYL)HEXYLPHTHALATE	6	6
HEXACHLOROCYCLOPENTADIENE	50	50
PENTACHLOROPHENOL	1	1
PESTICIDES (ug/L)		
HEXACHLOROBENZENE	1	1
ENDRIN	2	2
HEPTACHLOR	0.4	0.4
HEPTACHLOR EPOXIDE	0.2	0.2
METHOXYCHLOR	40	40
TOXAPHENE	3	3
POLYCHLORINATED BIPHENYLS (ug/L)		
PCB-1016	0.5	0.5
PCB-1221	0.5	0.5
PCB-1232	0.5	0.5
PCB-1242	0.5	0.5
PCB-1248	0.5	0.5
PCB-1254	0.5	0.5
PCB-1260	0.5	0.5
TOTAL PCB	0.03	0.03

TABLE 3-8

COMPARISON OF GROUNDWATER MONITORING CRITERIA
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

Chemical	Federal MCLs and/or RIDEM GQS (2002)(1)	Federal MCLs and/or RIDEM GQS (2007)(2)
METALS (ug/L)		
ALUMINUM	NA	NA
ANTIMONY	6	6
ARSENIC	10	10
BERYLLIUM	4	4
CHROMIUM	100	100
IRON	NA	NA
LEAD	15	15
MANGANESE	NA	NA
MERCURY	2	2
NICKEL	NA	NA

Notes:

NA - Not available.

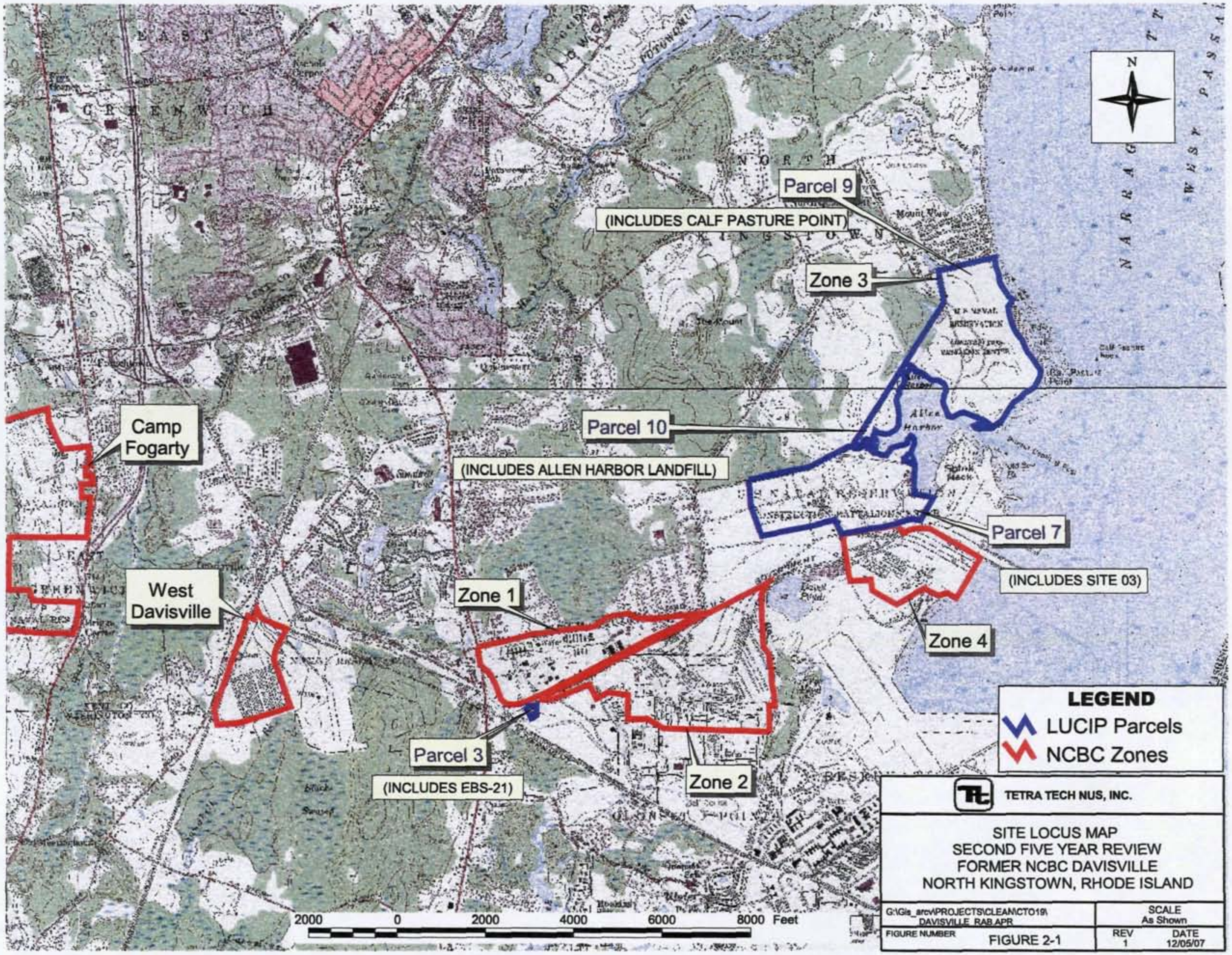
RIDEM - Rhode Island Department of Environmental Management.

1 - QAPP for Long Term Monitoring Plan of Site 07 (EA EST, May 2002).

2 - Lesser of USEPA MCLs (USEPA, August 2006) or RIDEM Groundwater Quality Standards (RIDEM, March 2005).

3 - No changes in numerical criteria noted.

FIGURES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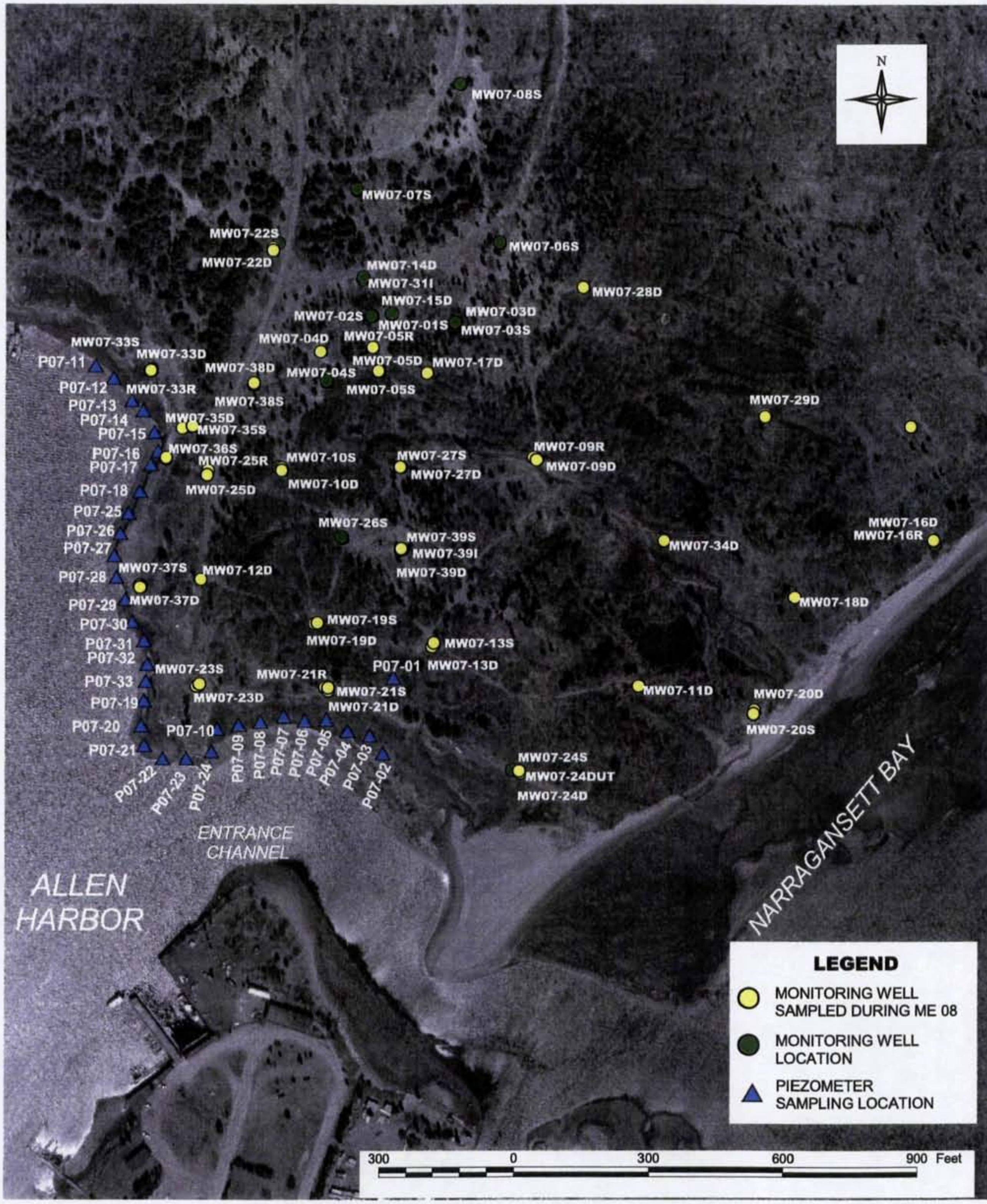
(INCLUDES CALF PASTURE POINT)
Zone 3
Camp Fogarty
Parcel 10
(INCLUDES ALLEN HARBOR LANDFILL)
Parcel 7
(INCLUDES SITE 03)
West Davisville
Zone 1
Zone 4
Parcel 3
(INCLUDES EBS-21)
Zone 2
LEGEND
LUCIP Parcels
NCBC Zones
N
2000 0 2000 4000 6000 8000 Feet
TETRA TECH NUS, INC.
SITE LOCUS MAP
SECOND FIVE YEAR REVIEW
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND
SCALE
As Shown
FIGURE NUMBER
FIGURE 2-1
REV
1
DATE
12/05/07



TETRA TECH NUS, INC.
55 Jonspin Road
Wilmington, MA 01887

CALF PASTURE POINT WELL/PIEZOMETER LOCATIONS
SECOND FIVE-YEAR REVIEW
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

SCALE
As Shown

FILE
G:\Gis_arcv\PROJECTS\CLEAN\CTO19\DAVISVILLE_CPPME08\FIG2-2

REV
0

DATE
11/20/07

FIGURE NUMBER
FIGURE 2-2

TETRA TECH NUS, INC. 55 Jonspin Road Wilmington, MA 01887	PARCEL NO. 9 SITE MAP SECOND FIVE YEAR REVIEW FORMER NCBC DAVISVILLE NORTH KINGSTOWN, RHODE ISLAND	SCALE As Shown FILE G:\Gis_arcv\PROJECTS\CLEAN\CTO19\DAVISVILLE_FINAL.APR REV 0 DATE 11/20/07 FIGURE NUMBER FIGURE 2-3

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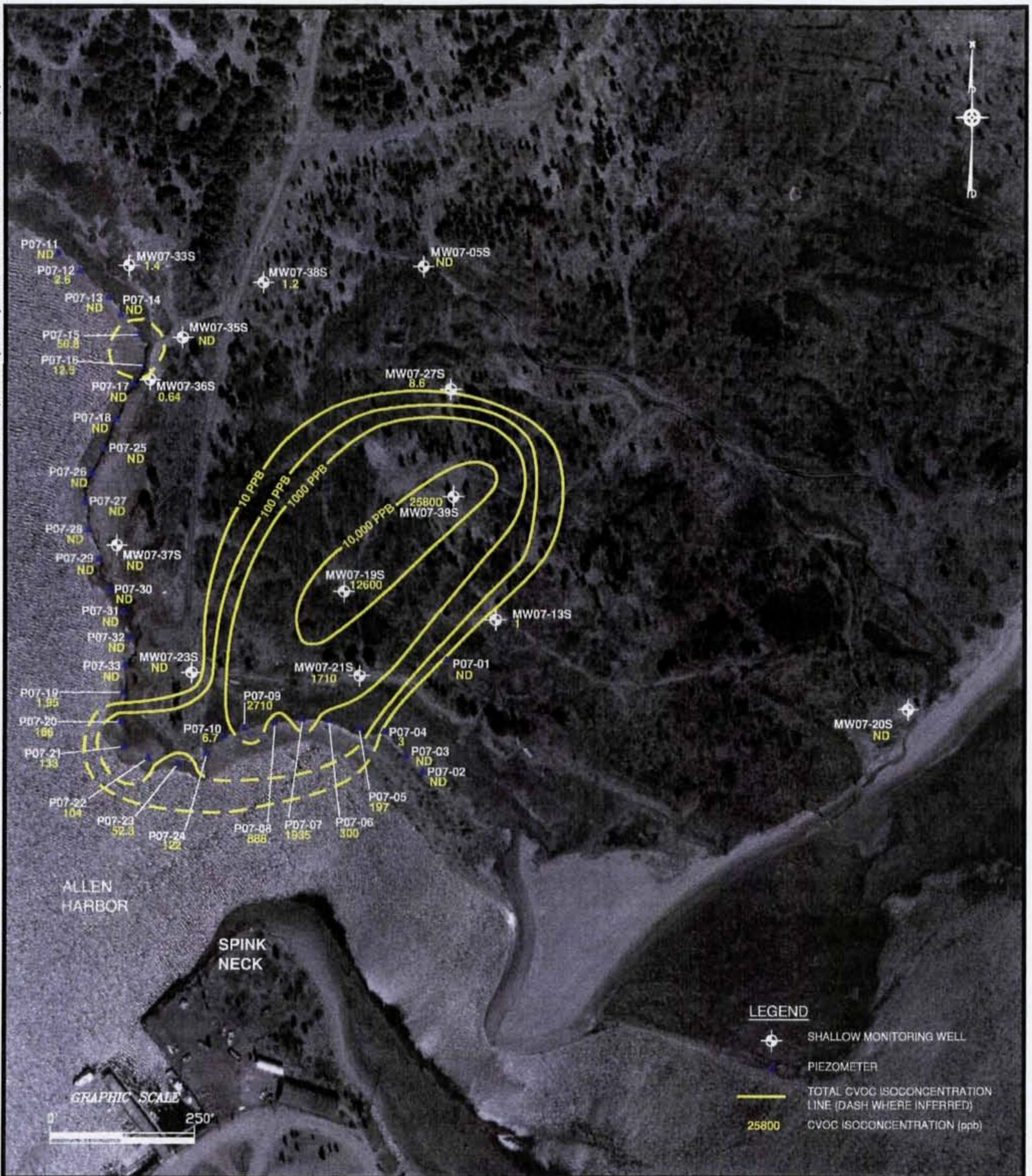

TETRA TECH NUS, INC.

TOTAL CVOCS DETECTED IN SHALLOW GROUNDWATER MONITORING WELLS
MONITORING EVENT 08 – FEBRUARY/MARCH 2007
SITE 07, NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

SCALE	AS NOTED
FILE	\00986\0230\CVOC_SHAL_ME08.DWG
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FIGURE NUMBER	2–4

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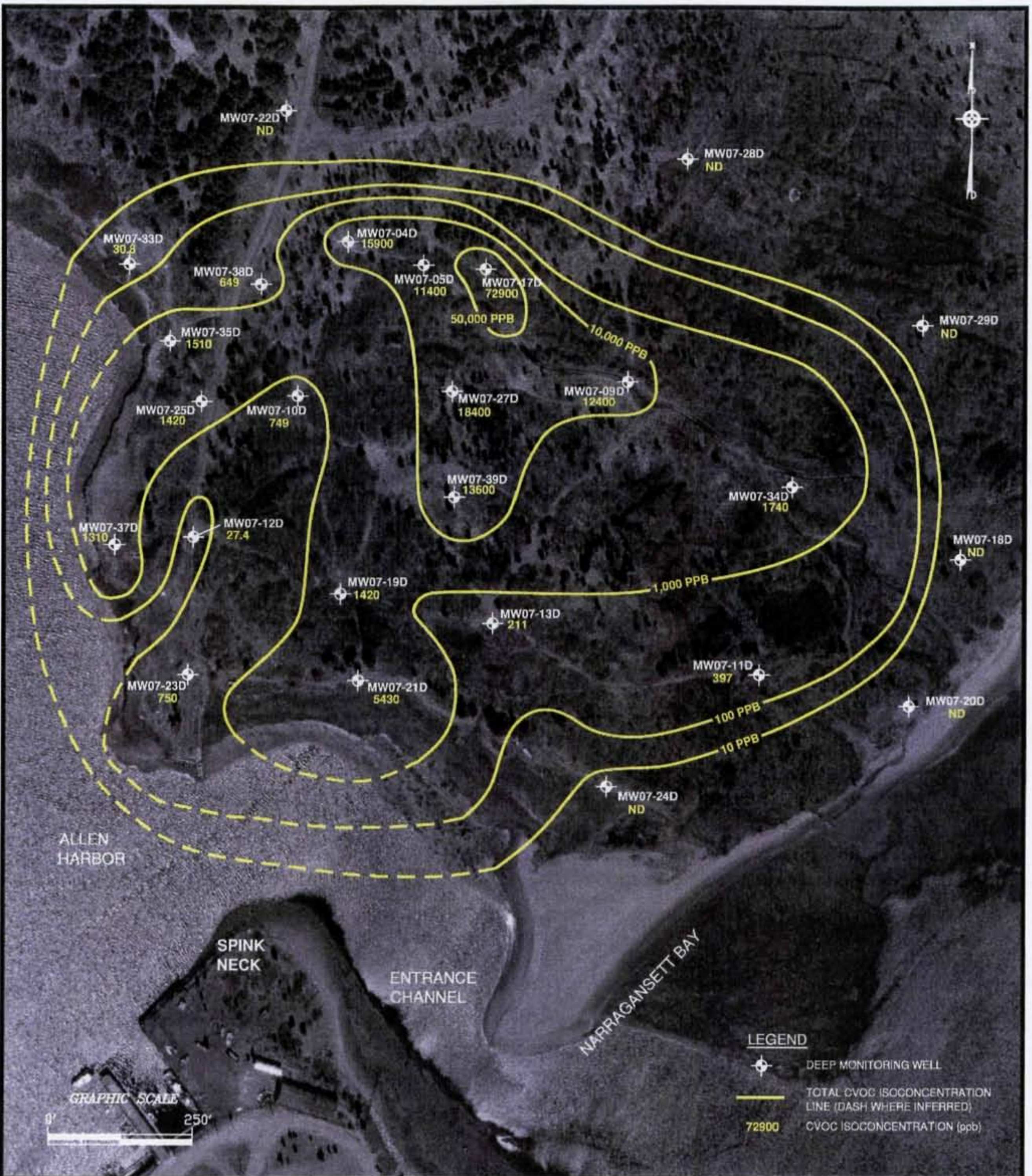
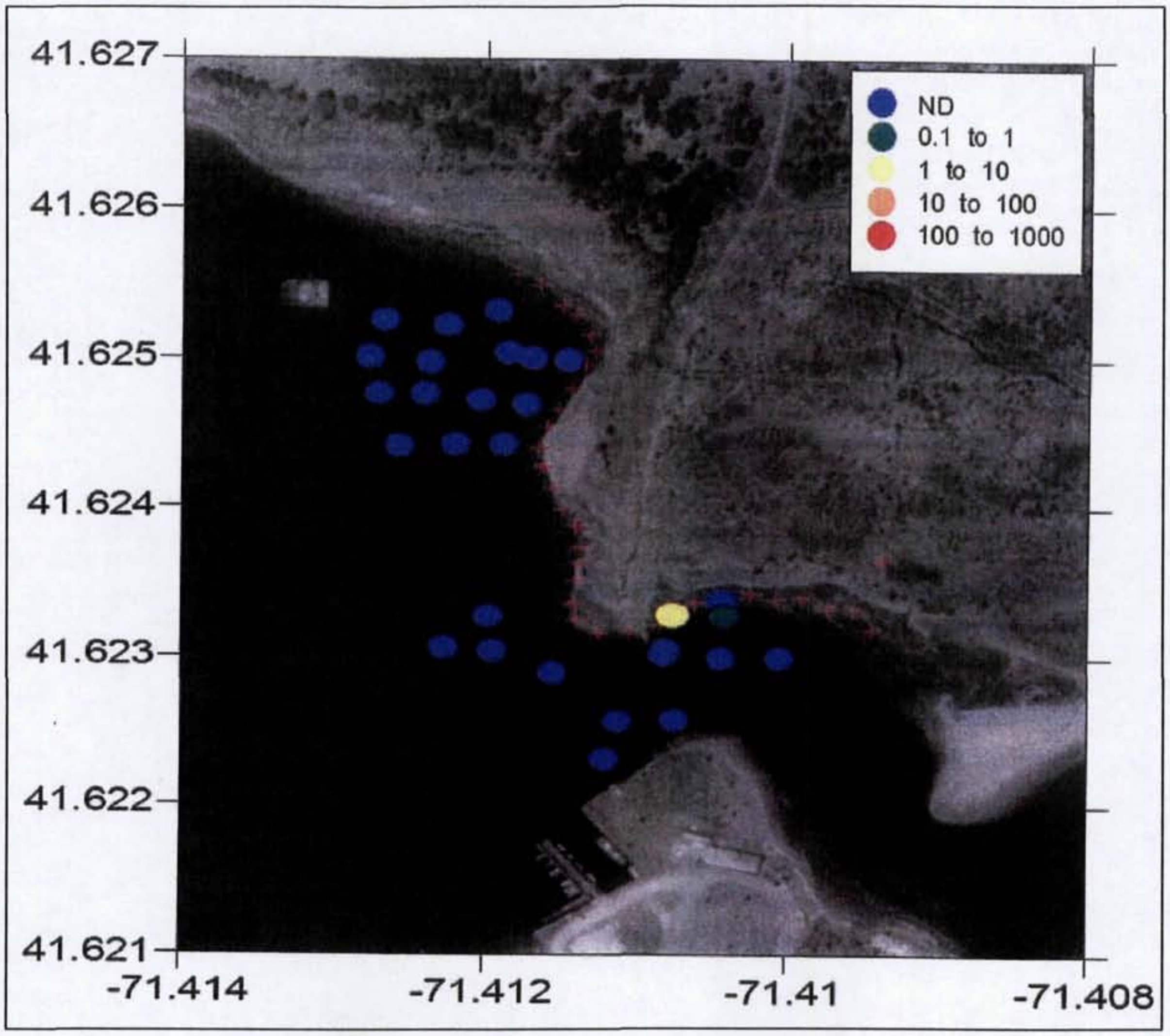


TETRA TECH NUS, INC.	TOTAL CVOCS DETECTED IN DEEP GROUNDWATER MONITORING WELLS MONITORING EVENT 08 – FEBRUARY/MARCH 2007 SITE 07, NCBC DAVISVILLE NORTH KINGSTOWN, RHODE ISLAND	SCALE AS NOTED FILE \00986\0230\CVOC_DEEP_ME08.DWG REV 0 DATE 02/28/08 FIGURE NUMBER 2–5

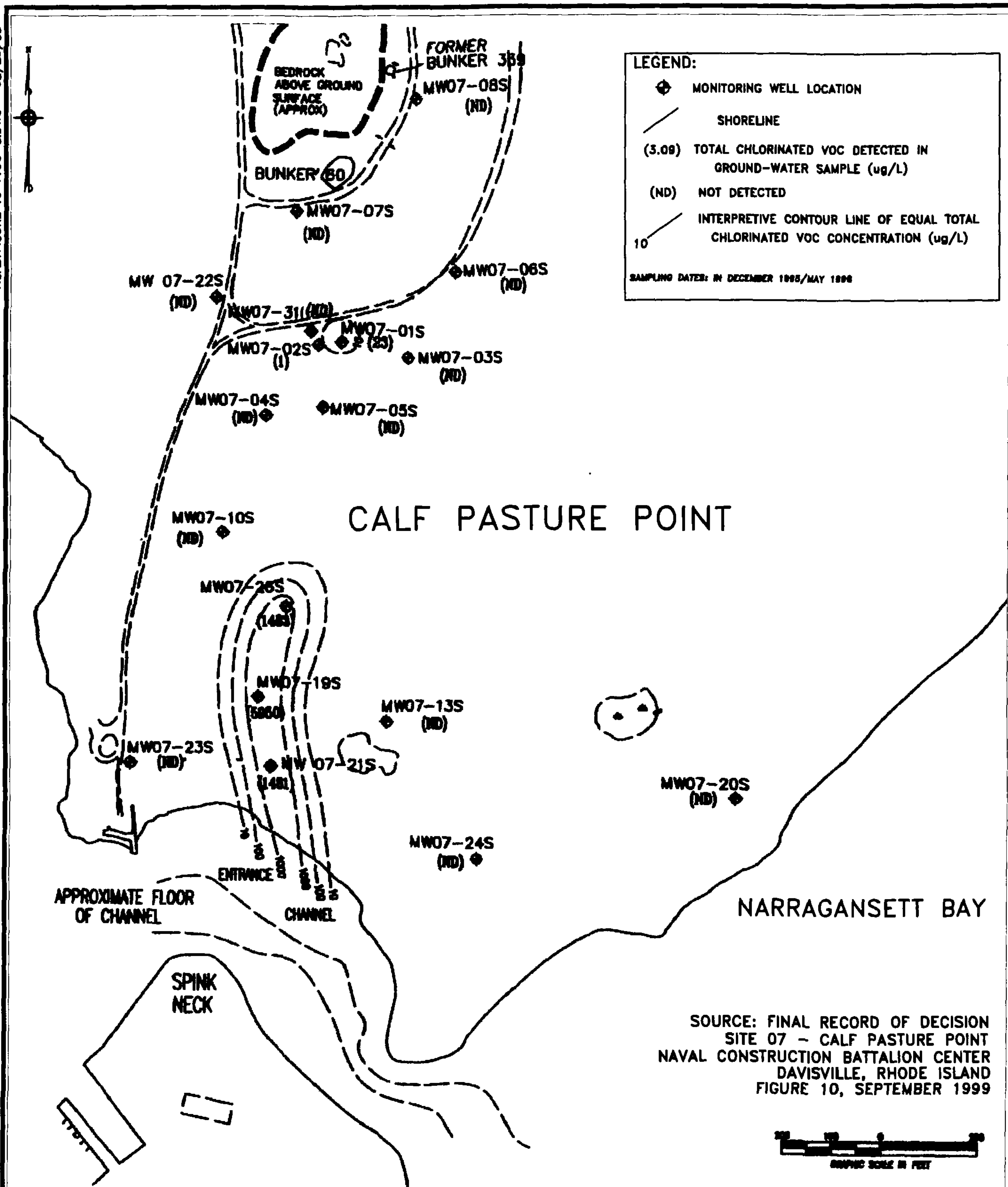


NOTES:

1. UNITS ARE IN MICROGRAMS PER LITER.
2. FIGURE ADAPTED FROM 'DRAFT PROJECT REPORT, COASTAL CONTAMINANT MIGRATION MONITORING ASSESSMENT', NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND (SPAWAR, 2005).

TETRA TECH NUS, INC.	SUBSURFACE VINYL CHLORIDE RESULTS FOR THE ENTRANCE CHANNEL AND INNER HARBOR CALF PASTURE POINT FORMER NAVAL CONSTRUCTION BATALLION CENTER DAVISVILLE NORTH KINGSTOWN, RHODE ISLAND	SCALE: AS NOTED FILE: \1511\0210\SUB_VC.DWG REV: 0 DATE: 12/06/07 FIGURE NUMBER: 2-6

ACAD:FIGURE 10 TVOC-S.DWG 02/25/08

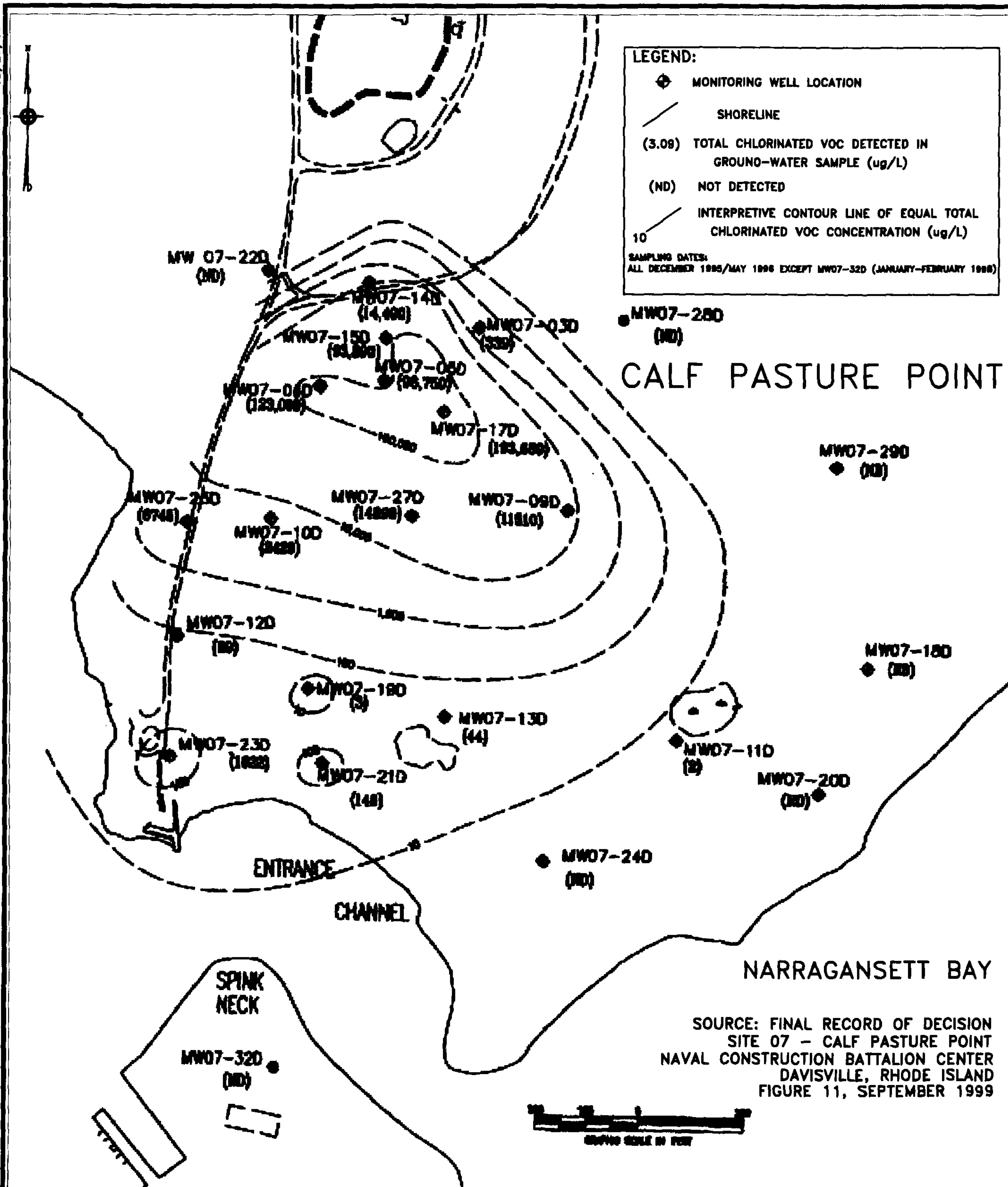


TETRA TECH NUS, INC.

DISTRIBUTION OF CVOCs IN SHALLOW OVERBURDEN IN 1995/96
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

SCALE	
AS NOTED	
FILE	
FIGURE 10 TVOC-S.DWG	
REV	DATE
0	2/25/08
FIGURE NUMBER	
FIGURE 2-7	

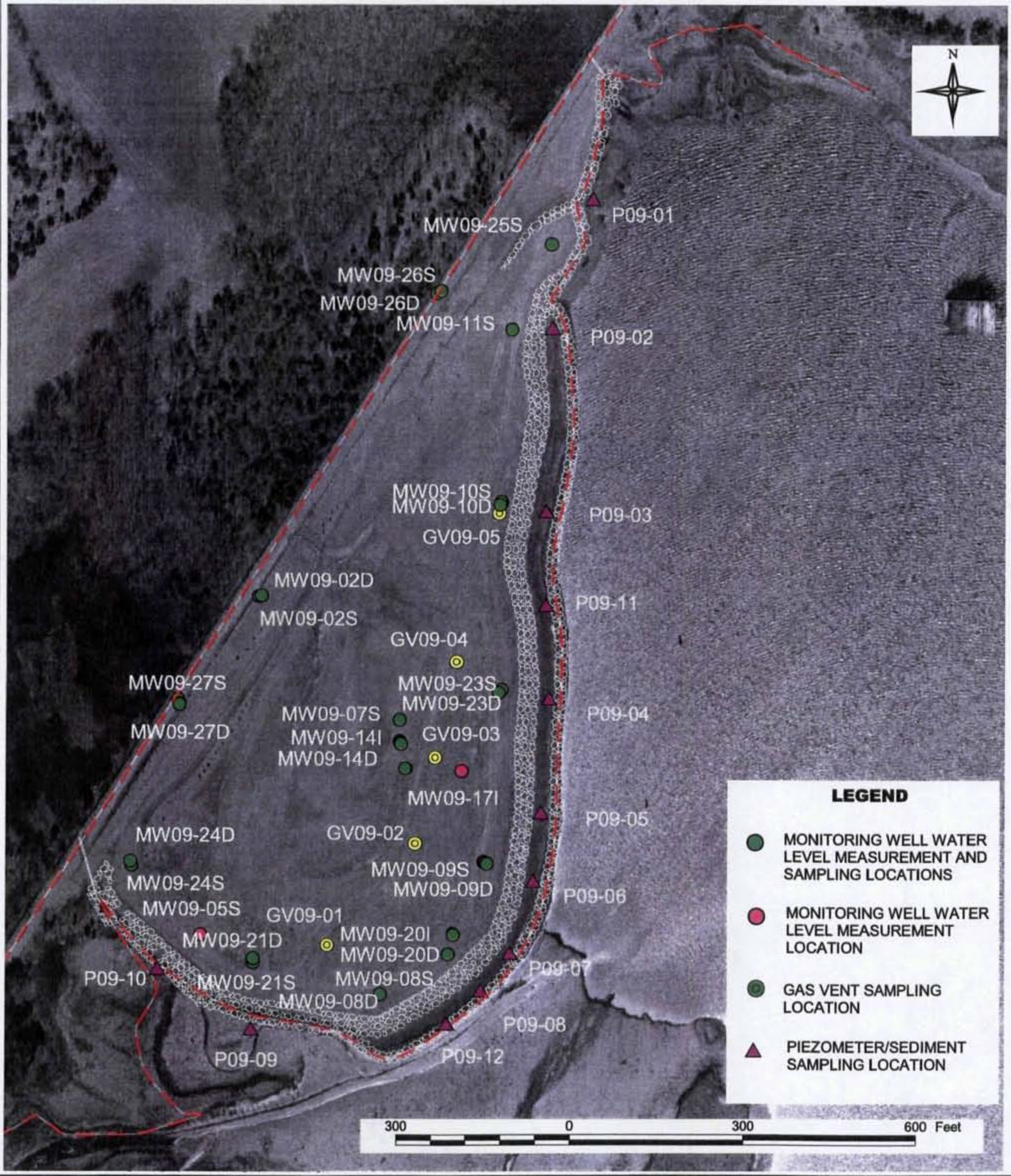
ACAD:FIGURE 11 TVOC-S.DWG 02/25/08



TETRA TECH NUS, INC.

DISTRIBUTION OF CVOCs IN DEEP OVERBURDEN IN 1995/96
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

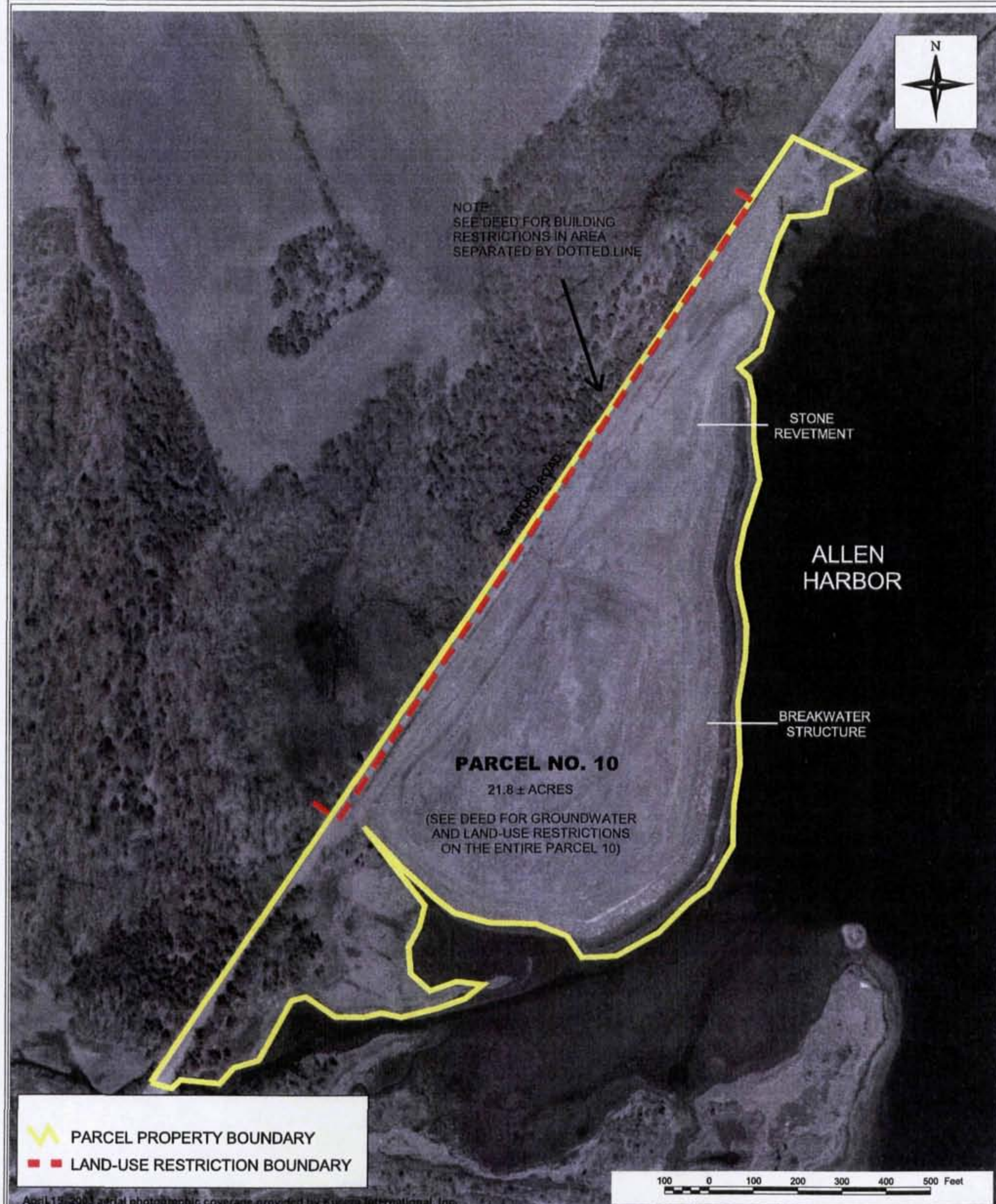
SCALE	AS NOTED
FILE	FIGURE 11 TVOC-S.DWG
REV 0	DATE 2/25/08
FIGURE NUMBER	FIGURE 2-8



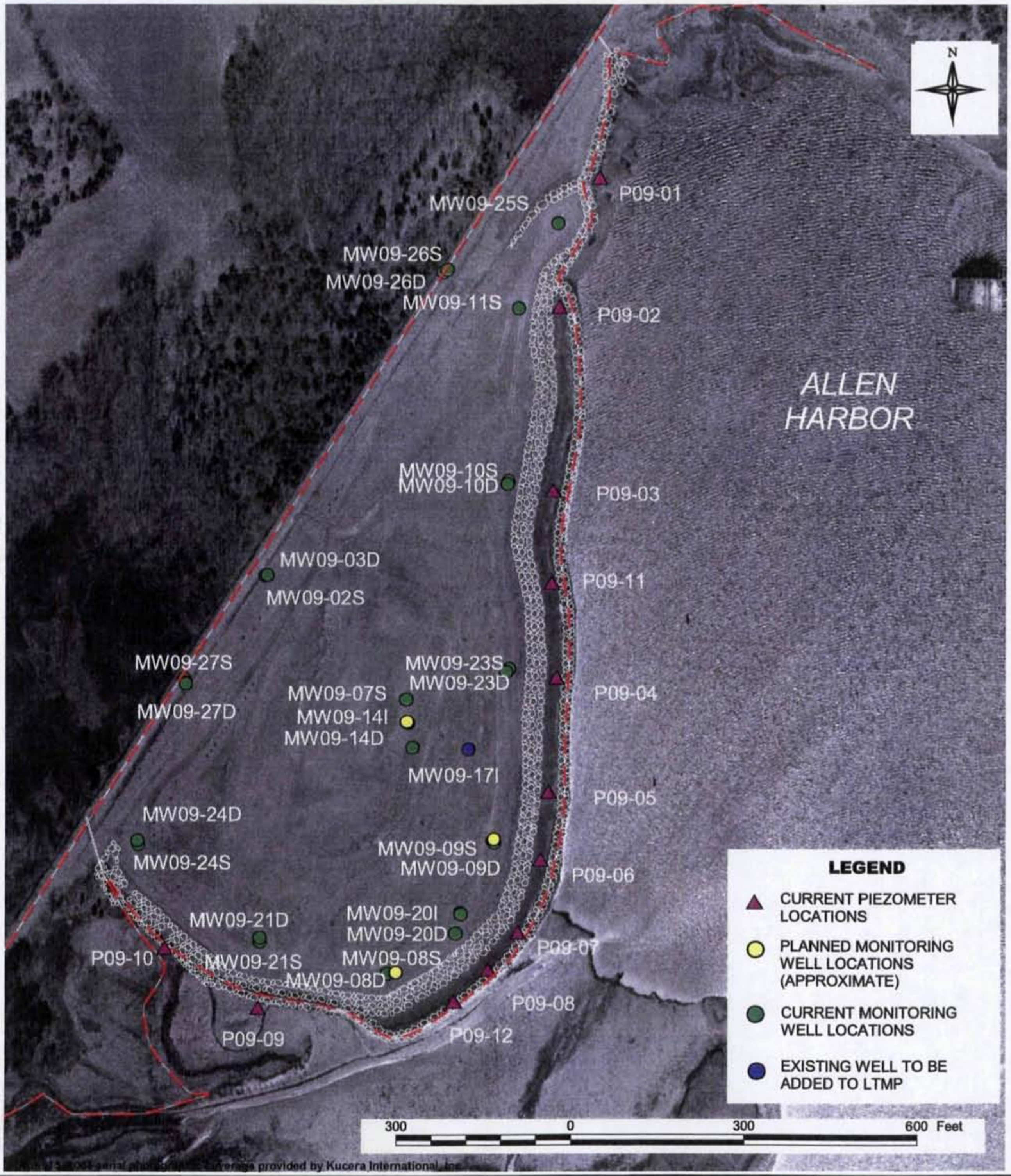
TETRA TECH NUS, INC.
55 Jonspin Road
Wilmington, MA 01887

ALLEN HARBOR LANDFILL SAMPLING LOCATIONS
SECOND FIVE YEAR REVIEW
SITE 09, FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

SCALE As Shown	
FILE G:\Gis_arcv\PROJECTS\CLEAN\CTO19\DAVISVILLE_REPLACEMENT.APR	
REV 0	DATE 2/29/08
FIGURE NUMBER FIGURE 3-1	



TETRA TECH NUS, INC. 55 Jonspin Road Wilmington, MA 01887	PARCEL NO. 10 SITE MAP SECOND FIVE-YEAR REVIEW FORMER NCBC DAVISVILLE NORTH KINGSTOWN, RHODE ISLAND	SCALE As Shown FILE G:\Gis_arcv\PROJECTS\CLEAN\CTO19\DAVISVILLE_FINAL.APR REV 0 DATE 11/21/07 FIGURE NUMBER FIGURE 3-2



TETRA TECH NUS, INC.
55 Jonspin Road
Wilmington, MA 01887

PLANNED MONITORING WELL LOCATIONS
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

SCALE As Shown	
FILE G:\Gis_arcv\PROJECTS\CLEAN\CTO19\DAVISVILLE_REPLACEMENTFYR.APR	
REV 0	DATE 2/28/08
FIGURE NUMBER FIGURE 3-3	

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REFERENCES

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APPENDIX A

INTERVIEW SUMMARIES, RAB PRESENTATION SLIDES, AND RAB QUESTIONNAIRE

INTERVIEW RECORD

Site Name: Former NCBC Davisville		**EPA ID No.:** RI6170022036	
Subject: Second Five-Year Review		**Time:** 1500 hrs	**Date:** 08/22/2007
Type: Telephone **X** Visit □ Other □			
Contact Made By:			
Name: Tom Campbell	**Title:** Scientist	**Organization:** Tetra Tech NUS	
Individual Contacted:			
Name: Phillip Bergeron	**Title:** Public Works Director	**Organization:** Town of North Kingstown	

Summary of Conversation

Mr. Philip Bergeron, Town of North Kingston Public Works Director, stated he knew more about CPP site than the AHL site. He felt that CPP was moving forward and that the Town of North Kingstown was planning on developing the site into a park (public access) with bicycle and foot paths. He was concerned about delays due to environmental concerns. Public access to the site will be postponed until contamination issues at the site are better understood. Mr. Bergeron stated that liability issues concerned him.

Mr. Bergeron felt well informed on the status and monitoring activities at the two sites. The Town attends the RAB meetings.

Mr. Bergeron had few concerns with regard to AHL. He stated that the town wants to open a recreational path on the site. He was aware that long-term monitoring was ongoing and had no concerns with that effort. Past issues at this site were erosion caused by mountain bicycles and all terrain vehicles (ATVs).

In conclusion, Mr. Bergeron repeated that he was concerned with the liability issue of public exposure once CPP is opened up to public access. The site has great recreational potential due to beaches that are present on the site. His concerns included the nature of the contamination, the potential for exposure, and maintaining the warning signs. He was also concerned that the contamination might be spreading.

INTERVIEW RECORD

Site Name: Former NCBC Davisville	**EPA ID No.:** RI6170022036	
Subject: Second Five-Year Review	**Time:** 0900 hrs	**Date:** 09/25/2007
Type: Telephone X Visit ☐ Other ☐		

Contact Made By:

Name: Tom Campbell	**Title:** Scientist	**Organization:** Tetra Tech NUS

Individual Contacted:

Name: Steven King	**Title:** Chief Operating Officer	**Organization:** Quonset Development Corporation

Summary of Conversation

Mr. Steven King, Quonset Development Corporation, stated that he had no issues or problems with the AHL or CPP sites. He felt well informed on the sites progress and had no recommendations.

INTERVIEW RECORD

Site Name: Former NCBC Davisville		**EPA ID No.:** RI6170022036	
Subject: Second Five-Year Review		**Time:** 0900 hrs	**Date:** 09/27/2007
Type: Telephone X Visit □ Other □			

Contact Made By:

Name: Tom Campbell	**Title:** Scientist	**Organization:** Tetra Tech NUS

Individual Contacted:

Name: Elyse LaForest	**Title:** Federal Lands to Parks Program	**Organization:** National Park Service

Summary of Conversation

Ms. Elyse LaForest, National Park Service, stated that her concern with the two sites is that they are not being used as parks. Ms. LaForest conducted a site review and was disappointed in the lack of accessibility to the sites. She remarked that there were "No Trespassing" signs and gates restricting access. She viewed Allen Harbor Landfill but felt uncomfortable entering the Calf Pasture Point site. She stated that the sites were not in compliance with regard to the National Park Service program since the transfer of the sites to the Town of North Kingstown five years ago. She stated that she did not fault the Town's lack of progress (which she believed to be due to the contamination remaining on the sites) but said that the sites were not being utilized to their full potential. Ms. LaForest stated that she did not attend RAB meetings and had no communication with the Navy regarding the sites. In response to a question regarding archaeological sites, Ms. LaForest stated that she was unaware of any archaeological sites on either of the sites or any archaeological covenants related to the sites.

INTERVIEW RECORD

Site Name: Former NCBC Davisville	**EPA ID No.:** RI6170022036	
Subject: Second Five-Year Review	**Time:** 1200 hrs	**Date:** 10/17/2007
Type: Telephone X Visit ☐ Other ☐		

Contact Made By:

Name: Tom Campbell	**Title:** Scientist	**Organization:** Tetra Tech NUS

Individual Contacted:

Name: Jay O'Brien	**Title:** Resident	**Organization:** Town of North Kingstown

Summary of Conversation

Mr. Jay O'Brien, RAB member, commented on the two sites. Mr. O'Brien stated he was confident in the work performed by the Navy at CPP and AHL but felt that efforts to disseminate more information to the public should be improved. He stated that members of the public that did not attend the RAB meeting or members that missed meetings did not have any information passed on to them regarding the sites. Two solutions Mr. O'Brien suggested included posting meeting minutes on a web site or distributing a composite newsletter annually or semi-annually to the public in surrounding communities.

Mr. O'Brien stated that he felt site security was a concern. He remarked that the gate controlling access to the sites has been left unlocked and that there were opening in the fencing around the sites. Trespassers on the sites have included walkers on the beach, hunters, and motorized vehicles.

Mr. O'Brien had several suggestions for the AHL site. He felt that the site was not fulfilling one of its purposes as a walking/viewing area for the public. Original plans for benches have not been carried out because of concerns of damage to the landfill cap. A second concern was the purpose of the split rail fence along the western perimeter of the AHL site. He remarked that the fence was in a state of disrepair and its original purpose is not clear.

Mr. O'Brien remarked that the reports produced by the Navy are not "public friendly" and that they contained too much scientific jargon. He felt that if the public had a better understanding of the sites it would help alleviate their concerns directed at contamination remaining on the sites.

INTERVIEW RECORD

Site Name: Former NCBC Davisville	**EPA ID No.:** RI6170022036	
Subject: Second Five-Year Review	**Time:** 1115 hrs	**Date:** 10/18/2007
Type: Telephone X Visit □ Other □		

Contact Made By:		
Name: Tom Campbell	**Title:** Scientist	**Organization:** Tetra Tech NUS
Individual Contacted:		
Name: Bill Prescott	**Title:** Resident	**Organization:** Town of North Kingstown

Summary of Conversation

Mr. Bill Prescott, RAB member, stated he did not see much progress happening at the CPP and AHL sites. He stated that at AHL, the cap had been constructed and the area was to be opened to passive recreation uses. He noted that there was construction activity in the AHL area for a new parking lot. Mr. Prescott felt that the AHL area was safe to enter and that a single loop trail was present on the landfill.

Mr. Prescott recommended a grant to place signs on the CPP site and construct gates. He felt that the signs should address potential hazards associated with the site. Mr. Prescott felt well informed on the activities at the two sites and that he was also informed about the occurrence of RAB meetings.

Mr. Prescott stated that trespassing was an issue at the CPP site. He remarked that he was observed a couple with a baby walking on the beach of the CPP site. In addition, Mr. Prescott has observed young adults riding dirt bikes on the cap of the AHL site. He believes that these same individuals have cut holes in the existing fencing at the AHL site.

INTERVIEW RECORD

Site Name: Former NCBC Davisville	**EPA ID No.:** RI6170022036	
Subject: Second Five-Year Review	**Time:** 0900 hrs	**Date:** 10/18/2007
Type: Telephone **X** Visit ☐ Other ☐		

Contact Made By:

Name: Tom Campbell	**Title:** Scientist	**Organization:** Tetra Tech NUS

Individual Contacted:

Name: Lorena Pugh	**Title:** Resident	**Organization:** Town of North Kingstown

Summary of Conversation

Ms. Lorena Pugh, RAB member, stated she did not see much progress at the two sites towards becoming parks. She remarked that trespassing at CPP by off-road vehicles occurred daily. These vehicle operators are creating new paths, destroying vegetation, and causing erosion. She believed that the vehicles accessed the site through the beach and that they traveled from the Mountain View housing area. Ms. Pugh believed that the CPP was becoming habitat for fisher cats and coyotes, which posed a threat to domestic pets. She also remarked that hunters were not following rules regarding where they could discharge their weapons. She stated that she did not feel that the AHL was being used for its purpose, although she occasionally observed dog walkers.

Ms. Pugh observed fires that had been started by local youths and not properly extinguished. In addition, refuse was disposed on the ground in these fire pit areas.

Ms. Pugh felt that RAB meetings could be better advertised. She did not believe that most people living in the area were well informed of the current condition of the two sites.

INTERVIEW RECORD

Site Name: Former NCBC Davisville		**EPA ID No.:** RI6170022036	
Subject: Second Five-Year Review		**Time:** 1115 hrs	**Date:** 09/05/2007
Type: Telephone X Visit ☐ Other ☐			
Contact Made By:			
Name: Tom Campbell	**Title:** Scientist	**Organization:** Tetra Tech NUS	
Individual Contacted:			
Name: Jonathan Reiner	**Title:** Planning and Development Coordinator	**Organization:** Town of North Kingstown	

Summary of Conversation

Mr. Jonathan Reiner, Town of North Kingstown Planning and Development Director, commented on the Alan Harbor Landfill (AHL) and Calf Pasture Point (CPP) sites for the second 5-year review. He indicated that AHL had ongoing issues with trespassing teenagers on all terrain vehicles (ATVs), but was satisfied with the progress made at this site. His concern was regarding the long term impact of contamination leaching from the site towards the east into the harbor and towards the west into residential areas and the Quonset Point redevelopment area.

Mr. Reiner was concerned about long-term implications of contamination at CPP. He mentioned that he had concerns if access to this area was more unrestricted and available to recreation uses such as swimming. An issue he mentioned would be the health impacts from such activities.

Mr. Reiner felt well informed of the site's activities and was pleased with the email communication received from Tetra Tech NUS, Inc.

Mr. Reiner mentioned that he felt the signs at CPP could be improved. He suggested a wooden kiosk that provided more specific information on the types of contaminants that were present and their potential health effects. He felt that the signs currently on display were too general and in a state of disrepair.

Mr. Reiner stated that a clear answer on whether it was safe to open the area to unrestricted access has not yet been provided. He was concerned about what the town was going to open itself up to if full access was granted. He mentioned concerns that EPA personnel Christine Williams expressed at the RAB meetings regarding health issues. With regards to long-term monitoring, Mr. Reiner was not sure enough information was being obtained to make determinations with regard to the future use of CPP. He felt that clarification needed to be provided with regard to how the remaining contamination was going to be handled, i.e. was it just going to slowly continue to leach into the harbor. In addition, he was not convinced that everything had been done regarding the clean-up of CPP.

INTERVIEW RECORD

Site Name: Former NCBC Davisville		**EPA ID No.:** RI6170022036
Subject: Second Five-Year Review	**Time:** 1200 hrs	**Date:** 10/04/2007
Type: Telephone **X** Visit ☐ Other ☐		

Contact Made By:

Name: Tom Campbell	**Title:** Scientist	**Organization:** Tetra Tech NUS

Individual Contacted:

Name: Fred Santos	**Title:** LTM Field Team Leader	**Organization:** Environmental Chemical Corporation

Summary of Conversation

Fred Santos (Field Team Leader, ECC) discussed long-term monitoring at the CPP and AHL sites. He stated that the terrain and 45 minute window to sample monitoring wells at CPP posed a challenge. Wells were sampled by multiple teams using wagons to transport equipment. Global positioning satellite (GPS) equipment is used to locate monitoring well locations.

Mr. Santos remarked that on numerous occasions, local youths were observed riding bicycles and off-road motorcycles on the site. He stated that RIDEM was concerned about these occurrences and had requested that the North Kingstown Police Department increase their patrols in the area.

Mr. Santos discussed the challenges presented by the piezometer sampling program. He stated that during the previous contractor's (EA) sampling program, piezometers were removed after sampling and locations were marked with wooden stakes. During ECC's sampling efforts, some of the wooden stakes could not be located and piezometers were installed in approximate locations. It was further noted that analytical results from the newly installed piezometers were several orders of magnitude greater than those results during EA's sampling efforts. Also adding to the difficulty of piezometer sampling is the low recharge rates, which extend sampling efforts over several days for some piezometer locations. I asked Mr. Santos about the lack of caps observed on piezometers during the 5-year review walkover. He was surprised by this and stated that all piezometers were capped after sampling and that they may have been removed by trespassing youths.

Mr. Santos stated that sampling efforts were much easier at the AHL site. He remarked that the area adjacent to the wooden fence was wet and should not be traveled over by vehicle. Ruts that were present on the cap surface after previous sampling efforts had not been addressed although it was an issue of concern.

Second Five-Year Review for CERCLA Sites at the Former NCBC Davisville

Restoration Advisory Board Meeting

September 20, 2007

CERCLA/Superfund

- Remedial Investigation/Feasibility Study
- Record of Decision

The Selected Remedy is Protective of Human Health and the Environment

The remedy reduces risks to human health and the environment by restricting future site development, by eliminating current risk pathways (preventing ingestion/use of impacted ground water), and by monitoring the ground-water plume over time to confirm that the site continues to pose no unacceptable risks to human health or the environment.

NCBC Davisville **Site 07 Record of Decision**

X. SELECTED REMEDY

Based upon the results of the RI/FS, and based upon the community response to the Proposed Plan, the selected remedy for Site 09 is Alternative 3 - Multimedia Cap. A complete description of the selected alternative is presented in Section VIII of this ROD. The selected remedial alternative is a whole-site remedy which will be protective of human health and the environment. The ARARs for the selected remedy and the actions to be taken to meet them

NCBC Davisville Site 09 Record of Decision

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Statutory Requirement for Five-Year Reviews

- Under CERCLA § 121(c), if a remedial action results in hazardous substances or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the remedial action must be reviewed every five years to assure that human health and the environment are being protected.

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Completed CERCLA Remedial Actions at NCBC Davisville

- Calf Pasture Point
  - ROD signed in 1999
  - Long-term monitoring (9-month frequency)
  - Institutional controls
- Allen Harbor Landfill
  - ROD signed in 1997
  - Re-grading and construction of multimedia cap
  - Contaminated sediment removal
  - Shoreline stabilization
  - Institutional controls and long-term monitoring
- Previous five-year review (2003) deferred judgment of long-term protectiveness due to limited LTM data available at the time.

4

Purpose of the Five-Year Review

- The purpose of a five-year review is to determine whether the remedy implemented at a site is protective of human health and the environment. This is done by answering the following three questions:
  A. Is the remedy functioning as intended?
  B. Are the assumptions used when the remedy was selected still valid?
  C. Has any other information come to light that could call into question the protectiveness of the remedy?

5

Components of the Five-Year Review

- Review of Site Documents
- Site Inspection
- Interviews*
- Data Review
- Technical Assessment
- Report Preparation
- Recommendations & Follow-up Actions

6

Five-Year Review Report Contents

- Site history and background information
- Remedial action selection and implementation
- Operations and maintenance (if applicable)
- Site inspection observations
- Summary of site interviews*
- Data review
- Technical assessment (address the 3 questions)
- Deficiencies
- Recommendations and required actions
- Protectiveness statement

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Typical Interview Questions

1. What is your overall impression of the project?
2. Are you aware of any community concerns regarding either of these sites?
3. Are you aware of any problems, concerns associated with on-going monitoring and maintenance activities?
4. Do you feel that the land-use controls at these sites are adequately communicated to the public?
5. Do you feel well informed about the long-term monitoring activities?
6. Do you have any comments, suggestions, or recommendations regarding the management of the sites?

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Schedule

- Interviews – September 2007
- Draft Five-Year Review Report – Fall 2007
- EPA & RIDEM Review – Fall/Winter 2007/08
- Present Findings to RAB – March 2008
- Final Five-Year Review Report – March 2008 (copy to North Kingstown Free Library and EPA website: www.epa.gov/ne/superfund/sites/ncbc)

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Thank You

RAB QUESTIONNAIRE
CALF PASTURE POINT (SITE 07) AND ALLEN HARBOR LANDFILL (SITE 09)
2nd FIVE-YEAR REVIEW

1. What is your overall impression of the remedial actions and long-term monitoring activities at these sites?
   THEY SEEM TO BE ADEQUATE

2. Are you aware of any community concerns regarding either of these sites? Please provide details.
   NO

3. Are you aware of any problems or concerns associated with on-going monitoring and maintenance activities?
   NOT AT THIS TIME

4. Do you feel that the land-use controls at these sites are adequately communicated to the public?
   NO

5. Do you feel well informed about the long-term monitoring activities?
   YES.

6. Do you have any comments, suggestions, or recommendations regarding the management of these sites?
   THAT YOU CONTINUE TO TEST THE WELLS OF THOSE OF US WHO HAVE THEM

Name: ROSS A. PETTERUTI

Title: NORTH KINGSTOWN RESIDENT

Organization/Community:

RAB QUESTIONNAIRE
CALF PASTURE POINT (SITE 07) AND ALLEN HARBOR LANDFILL (SITE 09)
2nd FIVE-YEAR REVIEW

1. What is your overall impression of the remedial actions and long-term monitoring activities at these sites?
   have done a good job so far.

2. Are you aware of any community concerns regarding either of these sites? Please provide details.
   No

3. Are you aware of any problems or concerns associated with on-going monitoring and maintenance activities?
   No

4. Do you feel that the land-use controls at these sites are adequately communicated to the public?
   Yes

5. Do you feel well informed about the long-term monitoring activities?
   Yes.

6. Do you have any comments, suggestions, or recommendations regarding the management of these sites?
   No

Name: Charles Ward Jr.

Title:

Organization/Community: Mt View

APPENDIX B

CALF PASTURE POINT STATISTICAL ANALYSIS AND CONCENTRATION TREND GRAPHS

Chemical Trend Analysis for Calf Pasture Point LTM Data

Statistical methods were used to evaluate temporal trends in the Site 07 groundwater data for 1,1,2,2-tetrachloroethane (PCA), trichloroethene (TCE), and *cis*-1,2-dichloroethene (DCE). For each of these contaminants, trend analyses were performed for individual wells at the site if: 1) the well had been sampled three or more times (i.e., during three sampling events); and 2) the contaminant was detected in the well in at least two sampling events.

Three separate detailed statistical analyses were conducted to evaluate trends in individual wells, including linear regression analysis, the Mann-Kendall test, and the Sen test. Linear regression analysis involved fitting a linear regression of the form

$$\ln(C_t) = \alpha + \beta t$$

to the data from each well to test for the presence of a linear trend over time as proposed by Buscheck and Alcantar (1995). In this model, C_t represents contaminant concentration at time t, α represents the concentration at $t = 0$, and β is the average change in the logarithm of the contaminant per unit of time. A nonparametric approach suggested by Mann and Kendall (Mann, 1945; Kendall, 1938) was also used to test for a temporal trend at each well. Although the Mann-Kendall test can detect the presence of a trend, it gives no estimate of its magnitude. Sen (1968) proposed a nonparametric method for estimating a trend that is used here in conjunction with the Mann-Kendall result.

As concentration data frequently follow a log-normal distribution and normally distributed errors are an assumption of the parametric approach (linear regression), the logarithms of the data were used in the analysis (i.e., data were transformed by taking the logarithm of the concentration). Also, non-detects were represented by a value equal to one-half of the MDL; and, as stated previously, wells with less than three measurements and those wells with three or more measurements where contamination was never detected were not included in the analysis because in such cases the regression model parameters cannot be estimated.

Contaminant Trend Analysis Results

The results of the statistical analyses for 1,1,2,2-PCA, TCE and *cis*-1,2-DCE for the individual wells and piezometers are presented in Tables B-1, B-2, and B-3, respectively. Results are provided for the linear regression analysis (i.e., Buscheck-Alcantar method), the Mann-Kendall test, and the Sen test. The results for the linear regression method include the regression coefficient (an estimate of the change in ln [concentration] per year) and a p value; results for the Mann-Kendall method include the Mann-Kendall statistic and a p value; and results for the Sen test include the Sen nonparametric estimate of trend. The sign of the regression coefficient, Mann Kendall statistic, and the Sen estimate of trend indicate whether the trend is increasing (negative) or decreasing (positive). For the linear regression method and the Mann-Kendall test, a low p-value indicates a trend is statistically significant. A p-value of <0.20 indicates the trend is predicted with 80% confidence, and p-value of <0.05 indicates the trend is predicted with 95% confidence (significant results in Appendix A are shown in boldface and italics). The Sen test does not provide an indication of the statistical significance of the trend; instead, it provides an estimate of the direction of the trend (i.e., increasing or decreasing) and the magnitude of the trend. Therefore, the significance of the trend was determined based on the results (i.e., p-value) of the linear regression method and the Mann-Kendall Test; whereas, the magnitude of the trend is indicated by the linear regression method and the Sen test. Units for both the regression coefficient and the Sen estimate of trend are in ln (concentration) per year.

Asterisks indicate wells that have inadequate data (i.e., less than three sampling events) or wells that have never shown the presence of contamination. Other results shown on the tables include the percentage decrease (i.e., negative values indicate an increase in contamination concentration per year [% decrease per year]), as calculated from the linear regression method and the Sen estimate of trend. The percentage change was calculated using:

$$(100*[1-e^{(\text{trend estimate})}])$$

Table B-4 presents a listing of those wells and piezometers for which a statistically significant trend was observed (p-value <0.05 and/or <0.2); a well/piezometer was included in Table B-4 if any one of the statistical methods described above indicated a statistically significant trend. The trend analysis indicated that the majority of wells showed a decreasing trend for 1,1,2,2-PCA, although only two offshore piezometers showed a decreasing trend, compared to four piezometers exhibiting an increasing trend. For TCE, the majority of wells and piezometers showed an increasing trend. For *cis*-1,2-DCE, the majority of wells showed a decreasing trend, although the majority of piezometers and a significant number of wells showed an increasing trend.

Table B-1
Statistical Analyses for 1,1,2,2-PCA

Well/	No. of	Linear Regression			Mann-Kendall		Sen	
Piezometer	Samples	Estimate	p-Value	% Decrease	Statistic	Significance	Estimate	% Decrease
MW07-04D	9	0.32424	**0.0003**	27.6924	30	**0.0008**	0.3706	30.9680
MW07-05R	9	0.12145	0.3164	11.4366	14	*0.1802*	0.1266	11.8914
MW07-09D	5	0.10636	**0.0155**	10.0896	10	**0.0166**	0.1025	9.7422
MW07-09R	10	0.02297	0.7358	2.2710	-2	0.9330	-0.0082	-0.8234
MW07-10D	5	0.18654	**0.0040**	17.0176	8	*0.0834*	0.1942	17.6507
MW07-11D	9	-0.18605	**0.0019**	-20.4487	-34	**0.0000**	-0.2701	-31.0095
MW07-12D	10	0.12499	**0.0301**	11.7496	21	*0.0726*	0.1344	12.5760
MW07-13D	5	-0.01697	0.7979	-1.7119	2	0.8166	0.0199	1.9703
MW07-17D	4	0.16184	**0.0113**	14.9427	6	*0.0834*	0.1647	15.1852
MW07-19D	5	-0.17648	*0.1722*	-19.3011	-6	0.2334	-0.1795	-19.6619
MW07-19S	5	-0.03595	**0.0307**	-3.6603	-9	*0.0681*	-0.0261	-2.6444
MW07-21D	10	-0.17407	*0.0735*	-19.0143	12	0.3593	0.0685	6.6207
MW07-21R	10	0.04489	**0.0257**	4.3894	32	**0.0156**	0.0519	5.0576
MW07-21S	9	-0.00475	0.9332	-0.4758	-4	0.7614	-0.0561	-5.7703
MW07-23D	10	0.19911	**0.0005**	18.0540	36	**0.0069**	0.2089	18.8524
MW07-24Dut	7	*	*	*	*	*	*	*
MW07-25D	10	0.29194	0.2159	25.3187	23	**0.0466**	0.2091	18.8686
MW07-25R	10	0.30950	*0.1037*	26.6186	29	**0.0092**	0.2282	20.4035
MW07-27D	5	-0.01400	0.7290	-1.4099	2	0.8166	0.0242	2.3910
MW07-27S	4	*	*	*	*	*	*	*
MW07-33D	8	0.29312	0.2125	25.4071	10	0.2750	0.2512	22.2133
MW07-33R	8	-0.04886	0.8530	-5.0077	-2	0.9048	-0.1053	-11.1044
MW07-33S	8	0.55854	*0.0812*	42.7957	9	0.3616	0.3870	32.0909
MW07-34D	8	-0.40759	*0.0514*	-50.3198	-16	*0.0610*	-0.2009	-22.2503
MW07-35D	4	0.15631	**0.0330**	14.4703	4	0.3334	0.1359	12.7070
MW07-35S	6	*	*	*	*	*	*	*
MW07-37D	4	0.14218	**0.0382**	13.2533	4	0.3334	0.1350	12.6284
MW07-38D	4	-0.64959	0.7536	-91.4753	2	0.7500	0.2915	25.2858
MW07-38S	4	*	*	*	*	*	*	*
MW07-39D	4	-0.53979	0.2096	-71.5645	-2	0.7500	-0.4323	-54.0797
MW07-39I	4	-0.07052	0.2875	-7.3067	-4	0.3334	-0.0880	-9.1988
MW07-39S	4	0.02424	0.3987	2.3947	4	0.3334	0.0330	3.2461
P07-04	16	*	*	*	*	*	*	*
P07-05	16	0.32475	0.3992	27.7294	6	0.8248	0.0000	0.0000
P07-06	16	-0.23358	0.5072	-26.3111	-18	0.4502	-0.0312	-3.1692
P07-07	17	-0.57425	**0.0004**	-77.5798	-50	**0.0422**	-0.3375	-40.1440
P07-08	16	-0.45265	0.2610	-57.2468	38	*0.0960*	0.4473	36.0648
P07-09	17	-0.74794	**0.0090**	-111.2650	4	0.9032	0.0762	7.3369
P07-10	17	-0.20536	**0.0396**	-22.7964	12	0.6554	0.0371	3.6420
P07-13	7	*	*	*	*	*	*	*
P07-14	7	*	*	*	*	*	*	*
P07-15	7	-0.65358	**0.0278**	-92.2406	-11	*0.1362*	-0.6654	-94.5268
P07-16	7	-0.13905	0.6950	-14.9180	-3	0.7726	-0.0755	-7.8423
P07-19	7	*	*	*	*	*	*	*
P07-20	7	0.12150	0.8670	11.4411	-1	1.0000	-0.2176	-24.3090
P07-21	7	0.22096	0.7275	19.8249	3	0.7726	0.0654	6.3307
P07-22	7	0.70570	*0.1198*	50.6238	9	0.2388	0.2848	24.7835
P07-23	7	0.47417	0.2213	37.7598	7	0.3814	0.1498	13.9120
P07-24	16	-0.15067	0.2194	-16.2611	-18	0.4502	-0.0514	-5.2744

Table B-2
Statistical Analysis for TCE

Well/	No. of	Linear Regression			Mann-Kendall		Sen	
Piezometer	Samples	Estimate	p-Value	% Decrease	Statistic	Significance	Estimate	% Decrease
MW07-04D	9	0.11880	**0.0451**	11.2014	20	**0.0446**	0.1313	12.3045
MW07-05R	9	-0.02528	0.8376	-2.5597	-8	0.4768	-0.0167	-1.6840
MW07-09D	5	-0.04172	*0.1410*	-4.2604	-2	0.8166	-0.0391	-3.9874
MW07-09R	10	-0.19101	**0.0067**	-21.0473	-33	**0.0022**	-0.3074	-35.9885
MW07-10D	5	0.06055	*0.0890*	5.8755	8	*0.0834*	0.0564	5.4839
MW07-11D	9	-0.32565	*0.0777*	-38.4924	-26	**0.0058**	-0.8810	-141.3312
MW07-12D	10	-0.14338	**0.0009**	-15.4167	-30	**0.0228**	-0.1371	-14.6943
MW07-13D	5	-0.15703	**0.0013**	-17.0025	-10	**0.0166**	-0.1583	-17.1518
MW07-17D	4	0.08576	*0.1695*	8.2188	4	0.3334	0.0890	8.5154
MW07-19D	5	-0.47412	**0.0010**	-60.6605	-10	**0.0166**	-0.4926	-63.6566
MW07-19S	5	-0.06270	*0.1606*	-6.4707	-6	0.2334	-0.0691	-7.1543
MW07-21D	10	-0.29743	**0.0070**	-34.6393	-20	*0.1208*	-0.0757	-7.8639
MW07-21R	10	-0.04437	0.2397	-4.5372	-11	0.3808	-0.0499	-5.1166
MW07-21S	9	-0.01558	0.8029	-1.5699	-2	0.9194	-0.0454	-4.6446
MW07-23D	10	0.01898	0.5256	1.8800	11	0.3808	0.0392	3.8442
MW07-24Dut	7	-0.05264	0.2504	-5.4055	-5	0.5620	-0.0594	-6.1200
MW07-25D	10	0.10212	**0.0013**	9.7079	27	**0.0166**	0.0948	9.0445
MW07-25R	10	0.01693	0.7004	1.6789	1	1.0000	0.0000	0.0000
MW07-27D	5	-0.01170	0.5128	-1.1768	-2	0.8166	-0.0122	-1.2275
MW07-27S	4	0.39316	0.3242	32.5078	4	0.3334	0.6283	46.6502
MW07-33D	8	-0.00128	0.9846	-0.1286	0	1.0952	-0.0079	-0.7931
MW07-33R	8	-0.14901	0.2329	-16.0682	-10	0.2750	-0.0833	-8.6868
MW07-33S	8	0.53160	*0.0881*	41.2337	14	*0.1086*	0.5500	42.3050
MW07-34D	8	-0.90221	**0.0008**	-146.5037	-24	**0.0018**	-0.7654	-114.9854
MW07-35D	4	-0.05823	0.2490	-5.9959	-2	0.7500	-0.0406	-4.1435
MW07-35S	6	*	*	*	*	*	*	*
MW07-37D	4	-0.00307	0.9621	-0.3072	-2	0.7500	-0.0227	-2.2960
MW07-38D	4	0.15371	0.3594	14.2482	3	0.5264	0.1371	12.8117
MW07-38S	4	0.06061	0.9151	5.8810	0	1.2500	0.1002	9.5344
MW07-39D	4	-0.86897	*0.1791*	-138.4465	-4	0.3334	-0.8154	-126.0080
MW07-39I	4	-0.16178	**0.0419**	-17.5606	-6	*0.0834*	-0.1735	-18.9461
MW07-39S	4	-0.08691	0.2474	-9.0797	-4	0.3334	-0.0945	-9.9109
P07-04	16	*	*	*	*	*	*	*
P07-05	16	0.32167	0.3085	27.5063	10	1.0354	0.0000	0.0000
P07-06	16	-0.21773	0.5374	-24.3251	-1	1.0000	0.0000	0.0000
P07-07	17	-0.93838	**0.0003**	-155.5848	-54	**0.0274**	-0.6324	-88.2122
P07-08	16	-0.42347	0.3920	-52.7249	32	*0.1652*	0.4314	35.0401
P07-09	17	-1.06424	**0.0038**	-189.8624	-10	0.7150	-0.0852	-8.8935
P07-10	17	-0.49612	**0.0025**	-64.2344	6	0.8394	0.0247	2.4397
P07-13	7	0.13074	0.5034	12.2555	6	0.3909	0.1034	9.8234
P07-14	7	*	*	*	*	*	*	*
P07-15	7	-0.34983	**0.0394**	-41.8824	-13	*0.0690*	-0.2222	-24.8821
P07-16	7	-0.36130	*0.0832*	-43.5195	-13	*0.0690*	-0.2873	-33.2824
P07-19	7	-0.12050	0.3845	-12.8065	-9	0.2388	-0.1557	-16.8476
P07-20	7	0.28300	0.6475	24.6482	0	1.2500	0.0000	0.0000
P07-21	7	0.01546	0.9641	1.5343	1	1.0000	0.0457	4.4671
P07-22	7	0.55475	0.2433	42.5786	5	0.5620	0.4420	35.7250
P07-23	7	0.46329	0.2688	37.0791	3	0.7726	0.1257	11.8121
P07-24	16	-0.23472	0.4202	-26.4559	-10	0.6900	-0.0746	-7.7453

Table B-3
Statistical Analyses for *cis*-1,2-DCE

Well/ Piezometer	No. of Samples	Linear Regression			Mann-Kendall		Sen	
		Estimate	p-Value	% Decrease	Statistic	Significance	Estimate	% Decrease
MW07-04D	8	0.33922	**0.0287**	28.7673	21	**0.0365**	0.3066	26.4055
MW07-05R	8	-0.05197	0.7566	-5.3348	8	0.3988	0.1039	9.8685
MW07-09D	4	-0.00632	0.8110	-0.6338	-2	1.2500	-0.1200	-12.7497
MW07-09R	10	-0.32766	**0.0001**	-38.7724	-35	**0.0010**	-0.2408	-27.2267
MW07-10D	4	0.11047	**0.0130**	10.4586	6	*0.0834*	0.1080	10.2372
MW07-11D	8	-0.48647	**0.0002**	-62.6564	-22	**0.0056**	-0.5057	-65.8146
MW07-12D	9	0.18849	**0.0242**	17.1790	19	*0.0566*	0.1948	17.7001
MW07-13D	4	-0.10737	**0.0015**	-11.3348	-6	*0.0834*	-0.1065	-11.2378
MW07-17D	3	0.60331	0.3330	45.3005	3	0.3334	0.6151	45.9413
MW07-19D	4	-0.28024	**0.0219**	-32.3443	-6	*0.0834*	-0.2913	-33.8166
MW07-19S	4	-0.05162	0.2361	-5.2976	-4	0.3334	-0.0601	-6.1943
MW07-21D	9	0.00884	0.6645	0.8798	6	0.6122	0.0114	1.1335
MW07-21R	9	0.20516	**0.0353**	18.5480	20	**0.0446**	0.1576	14.5809
MW07-21S	8	0.01434	0.7868	1.4236	0	1.0952	-0.0007	-0.0700
MW07-23D	9	0.04930	*0.1455*	4.8103	13	*0.1801*	0.0522	5.0861
MW07-24Dut	7	0.00454	0.9785	0.4530	-1	1.0000	-0.0298	-3.0248
MW07-25D	9	0.53033	**0.0110**	41.1586	28	**0.0024**	0.2610	22.9719
MW07-25R	9	-0.11848	0.2705	-12.5780	-4	0.7614	-0.0488	-5.0010
MW07-27D	4	-0.00354	0.9244	-0.3546	0	1.2500	-0.0025	-0.2503
MW07-27S	4	0.15626	0.4227	14.4662	4	0.3334	0.2487	22.0186
MW07-33D	8	0.04502	0.2795	4.4025	10	0.2750	0.0487	4.7533
MW07-33R	8	-0.16474	*0.1470*	-17.9092	12	*0.1788*	-0.1097	-11.5943
MW07-33S	8	0.06366	0.7017	6.1676	6	0.5484	0.0834	8.0017
MW07-34D	8	-0.45408	**0.0026**	-57.4722	-25	**0.0286**	-0.3811	-46.3894
MW07-35D	4	0.25039	*0.1374*	22.1503	6	*0.0834*	0.3028	26.1253
MW07-35S	6	0.20874	0.4084	18.8395	5	0.4694	0.0938	8.9535
MW07-37D	4	0.08589	**0.0138**	8.2301	6	*0.0834*	0.0870	8.3323
MW07-38D	4	0.25138	*0.1358*	22.2270	6	*0.0834*	0.3157	27.0722
MW07-38S	4	0.08463	**0.0371**	8.1151	4	0.3334	0.0771	7.4203
MW07-39D	4	-0.53689	*0.1723*	-71.0678	-4	0.3334	-0.4245	-52.8826
MW07-39I	4	0.02704	0.4872	2.6676	2	0.7500	0.0116	1.1533
MW07-39S	4	-0.05008	0.3891	-5.1357	-2	0.7500	-0.0246	-2.4905
P07-04	16	-0.2427613	0.2771	-27.4764	-17	0.4925	-0.3176	-37.3827
P07-05	16	-0.34984	0.2700	-41.8839	18	0.4502	0.1904	17.3372
P07-06	16	-0.48917	**0.0108**	-63.0955	3	0.9315	0.0082	0.8166
P07-07	17	-0.63017	**0.0005**	-87.7930	-60	**0.0067**	-0.3624	-43.6774
P07-08	16	-0.75466	**0.0297**	-112.6878	0	1.0354	-0.0140	-1.4098
P07-09	17	-0.85578	**0.0043**	-135.3215	-34	*0.1766*	-0.2048	-22.7280
P07-10	17	-0.06148	0.3651	-6.3406	20	0.4396	0.0597	5.7953
P07-13	7	-0.10011	0.8343	-10.5295	-1	1.0000	-0.0635	-6.5559
P07-14	7	-0.02180	0.8591	-2.2039	0	1.2500	0.0000	0.0000
P07-15	7	-0.56625	**0.0085**	-76.1648	-13	*0.0690*	-0.5990	-82.0298
P07-16	7	-0.09064	0.5806	-9.4876	-2	*0.1583*	-0.2307	-25.9481
P07-19	7	*	*	*	*	*	*	*
P07-20	7	0.34022	0.6078	28.8387	3	0.7726	0.2847	24.7760
P07-21	7	0.13396	0.7042	12.5377	-1	1.0000	-0.0664	-6.8654
P07-22	7	0.13404	0.4963	12.5447	1	1.0000	0.0359	3.5263
P07-23	7	0.13109	0.5826	12.2865	-3	0.7726	-0.0678	-7.0151
P07-24	16	0.40729	*0.0578*	33.4551	37	*0.1247*	0.3887	32.2062

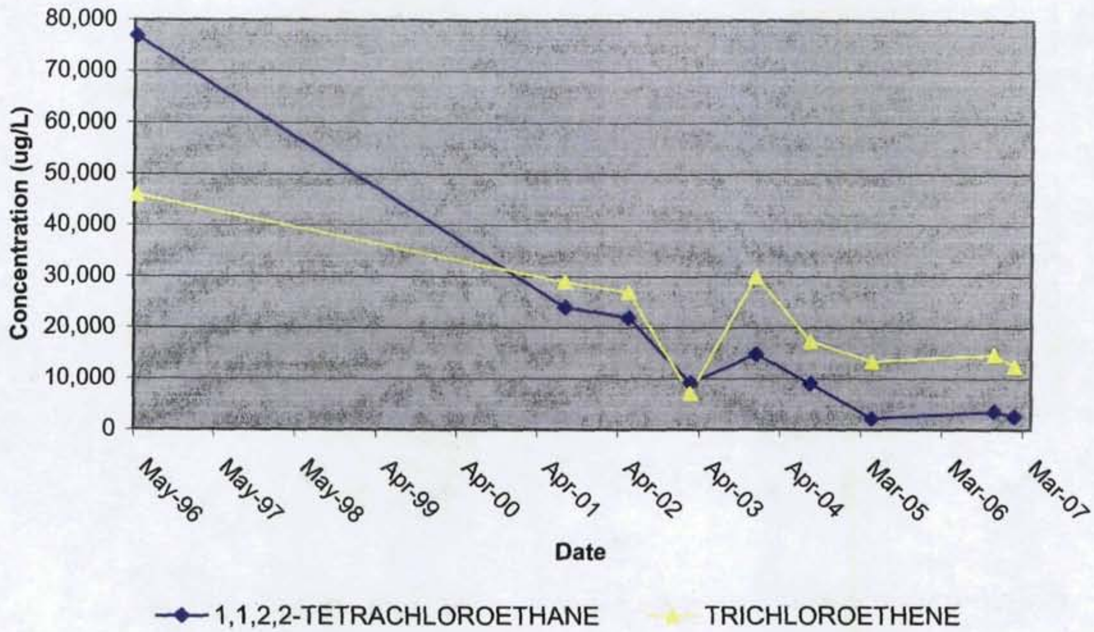
Table B-4
Summary of Trends Observed in Site 07 Wells and Piezometers

Analyte	Trend	Well	Piezometer
1,1,2,2-PCA	Increasing	MW07-11D MW07-19S *MW07-19D* *MW07-21D* *MW07-34D*	P07-07 P07-09 P07-10 P07-15
	Decreasing	MW07-04D *MW07-05R* MW07-09D MW07-10D MW07-12D MW07-17D MW07-21R MW07-23D MW07-25D MW07-25R *MW07-33S* MW07-35D MW07-37D	*P07-08* *P07-22*
TCE	Increasing	*MW07-09D* MW07-09R MW07-11D MW07-12D MW07-13D *MW07-19S* MW07-19D MW07-21D MW07-34D *MW07-39D* MW07-39I	P07-07 P07-09 P07-10 P07-15 *P07-16*
	Decreasing	MW07-04D *MW07-10D* *MW07-17D* MW07-25D *MW07-33S*	*P07-08*
cis-1,2-DCE	Increasing	MW07-09R MW07-11D MW07-13D MW07-19D *MW07-33R* MW07-34D *MW07-39D*	P07-06 P07-07 P07-08 P07-09 P07-15 *P07-16*
	Decreasing	MW07-04D MW07-10D MW07-12D MW07-21R *MW07-23D* MW07-25D *MW07-35D* MW07-37D *MW07-38D* MW07-38S	*P07-24*

Notes: Trend analysis performed using a 95% and 80% confidence interval; italic values indicate well exhibits a statistically significant trend with only an 80% confidence interval.

FIGURE B-1

CVOC DETECTED IN MW07-04D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



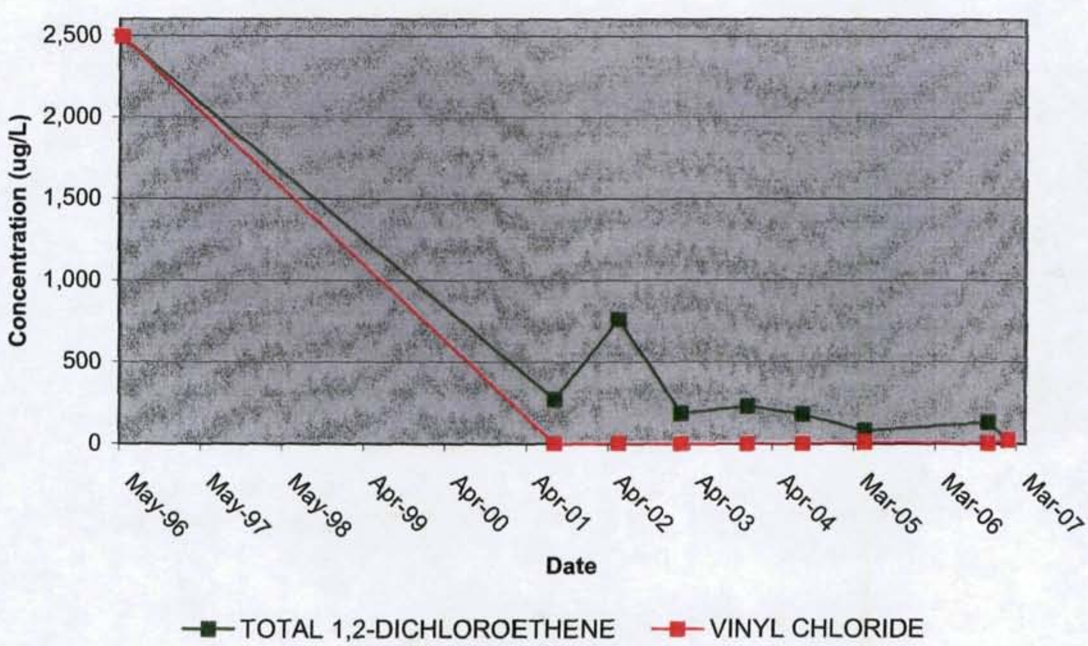
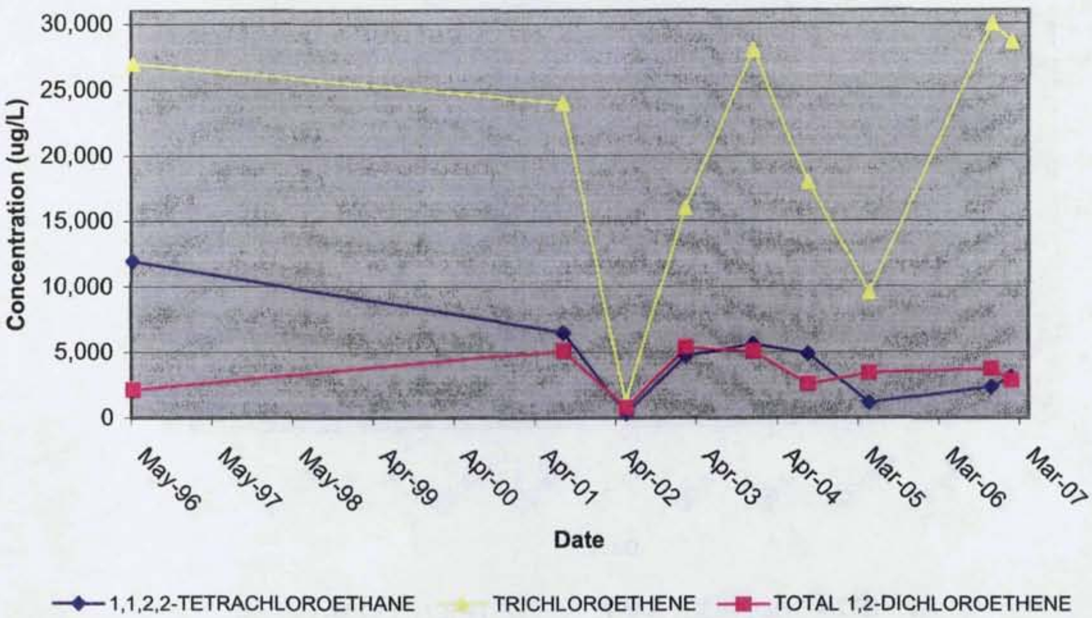


FIGURE B-2

CVOC DETECTED IN MW07-05R
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



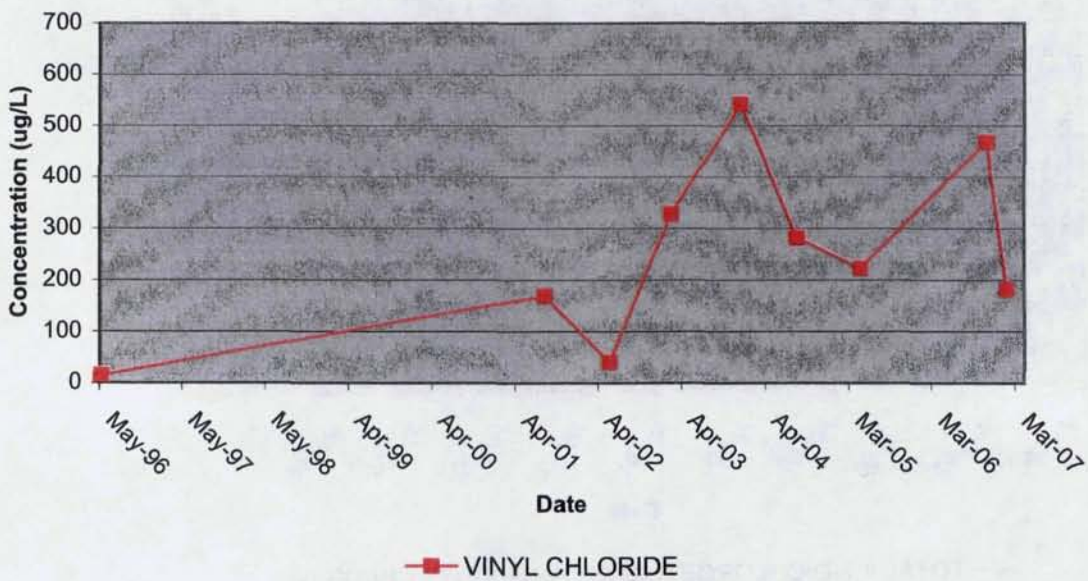
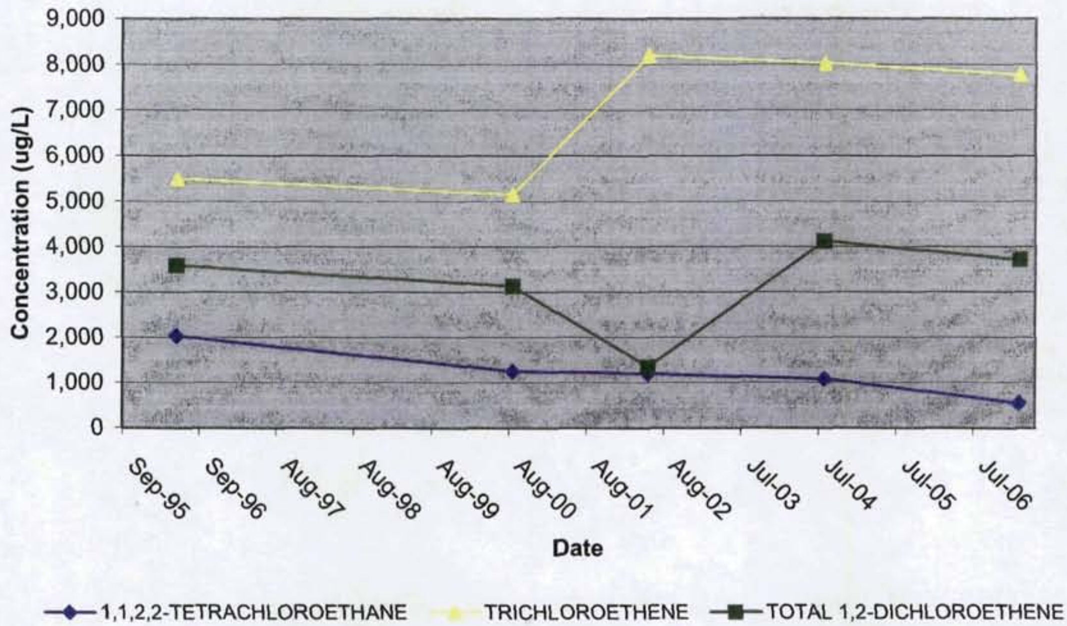


FIGURE B-3

CVOC DETECTED IN MW07-09D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



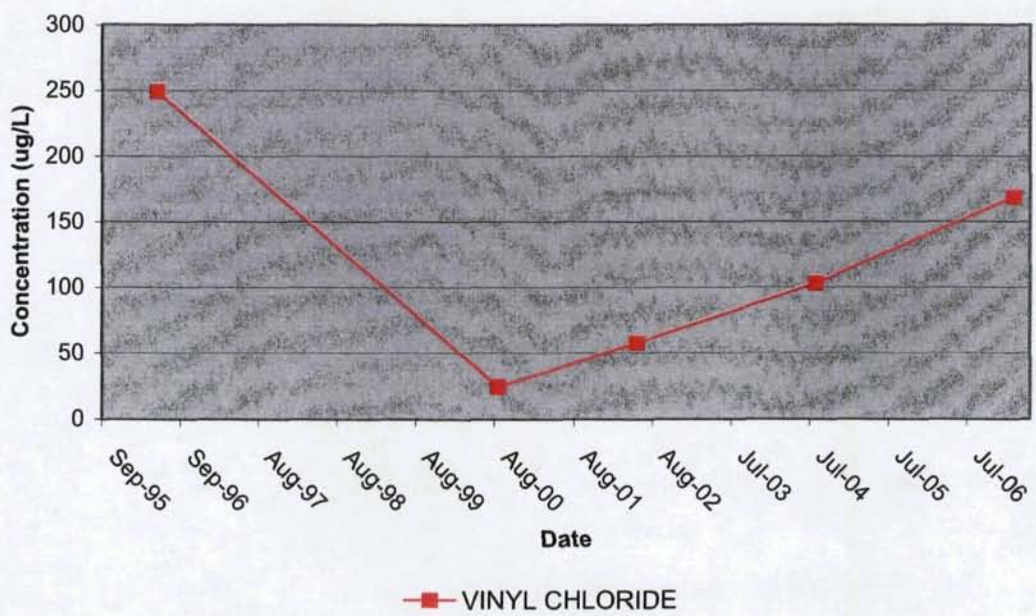
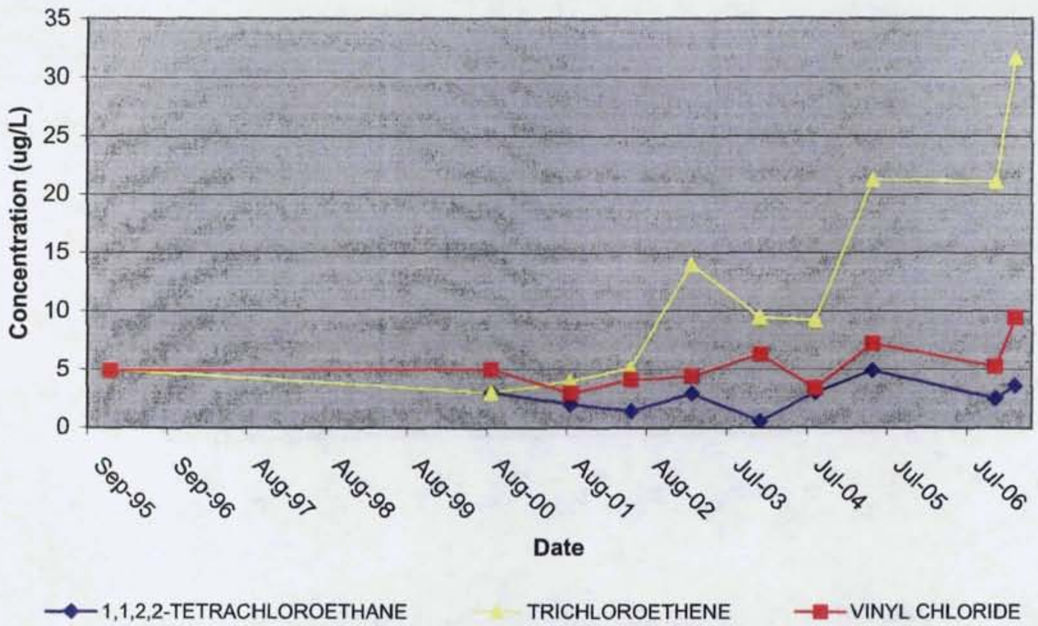


FIGURE B-4

CVOC DETECTED IN MW07-09R
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



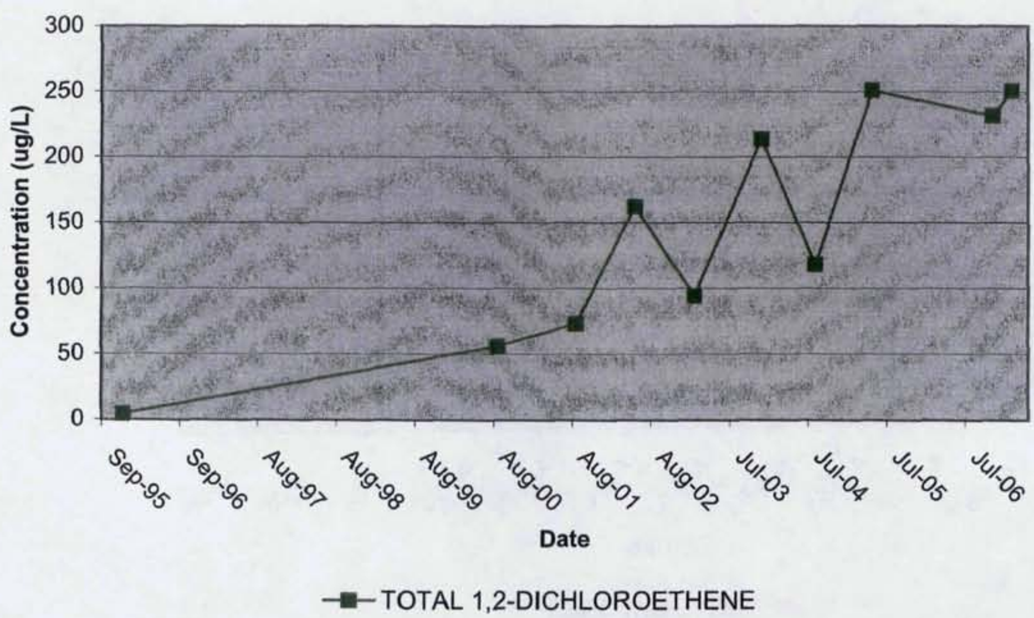
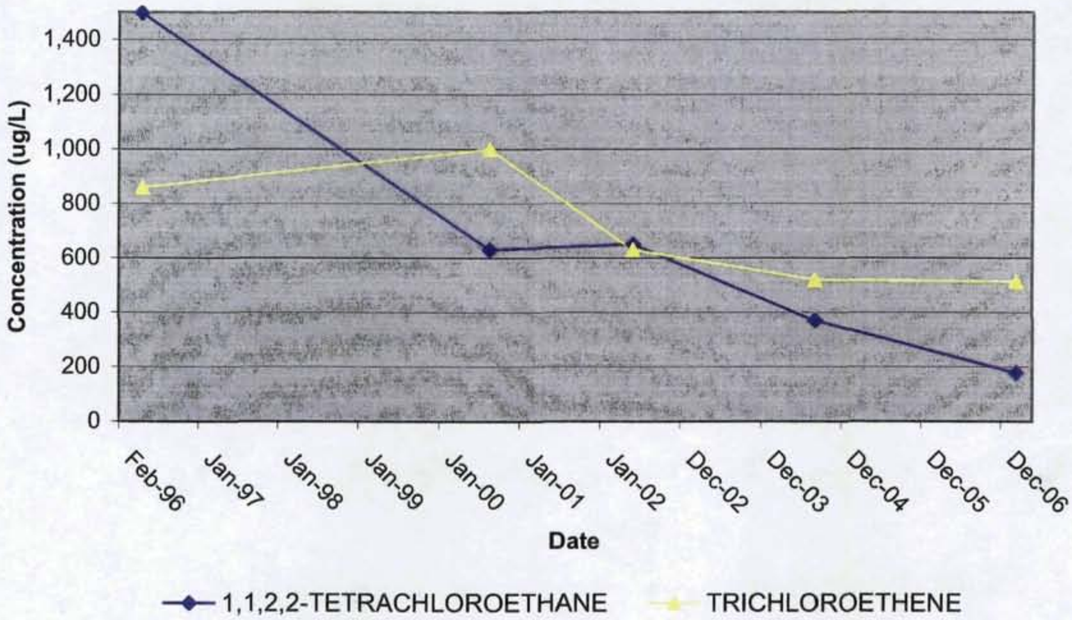


FIGURE B-5

CVOC DETECTED IN MW07-10D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



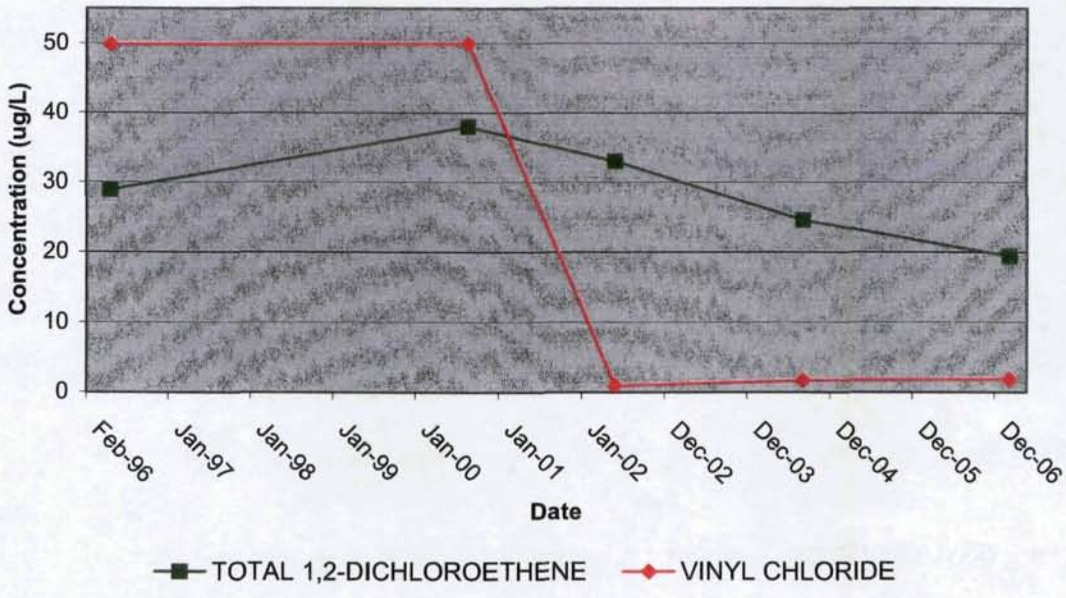
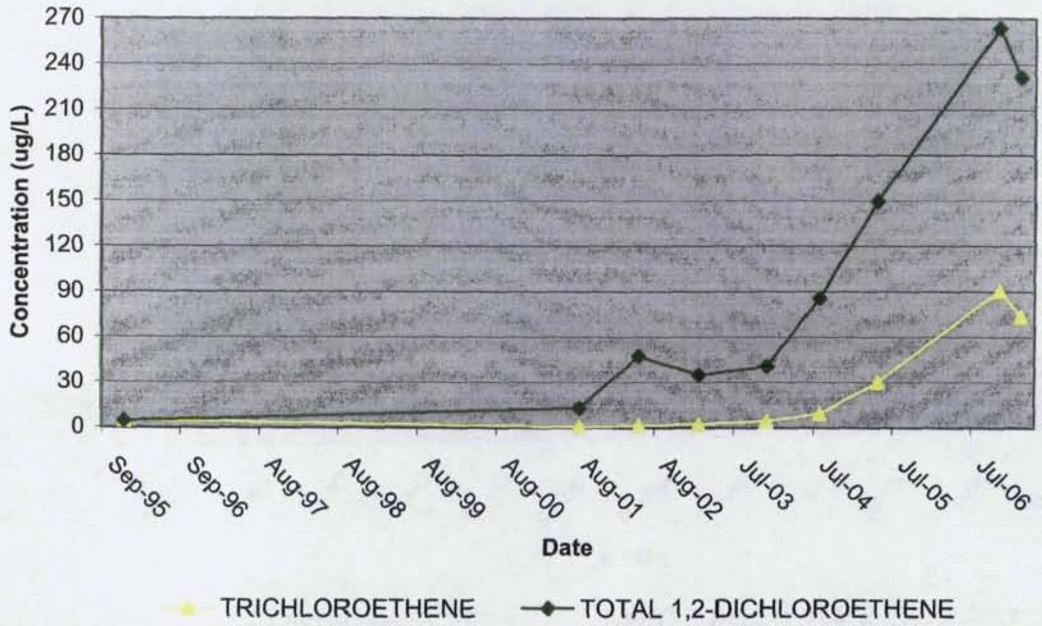


FIGURE B-6

**CVOC DETECTED IN MW07-11D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND**



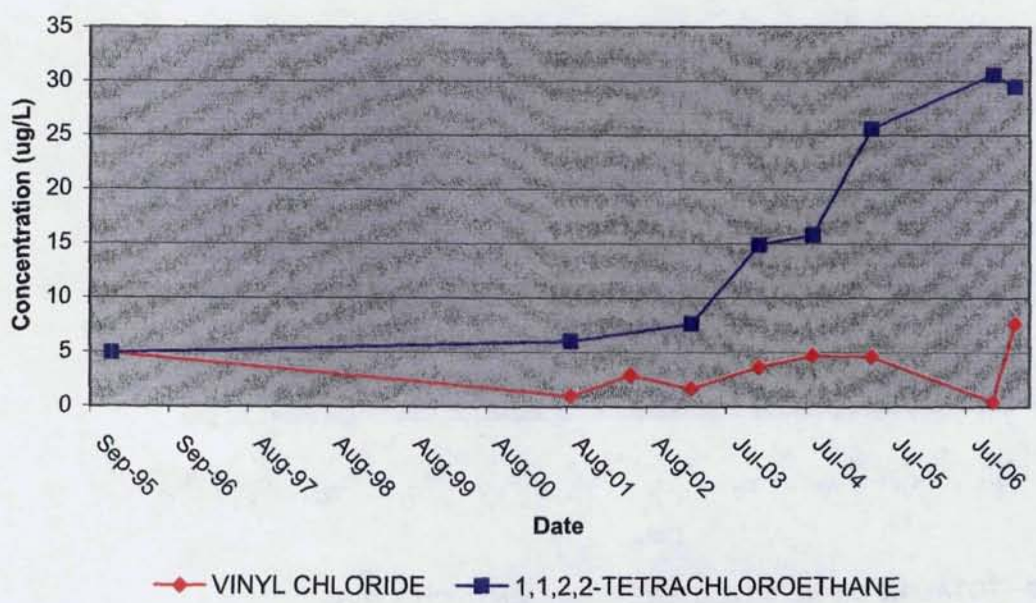
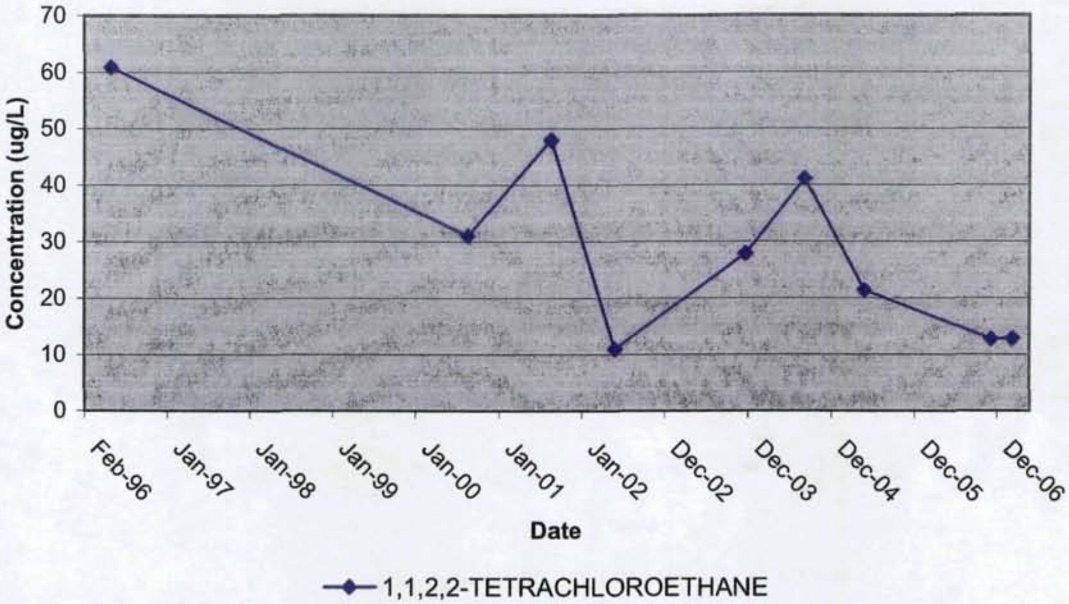


FIGURE B-7

CVOC DETECTED IN MW07-12D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



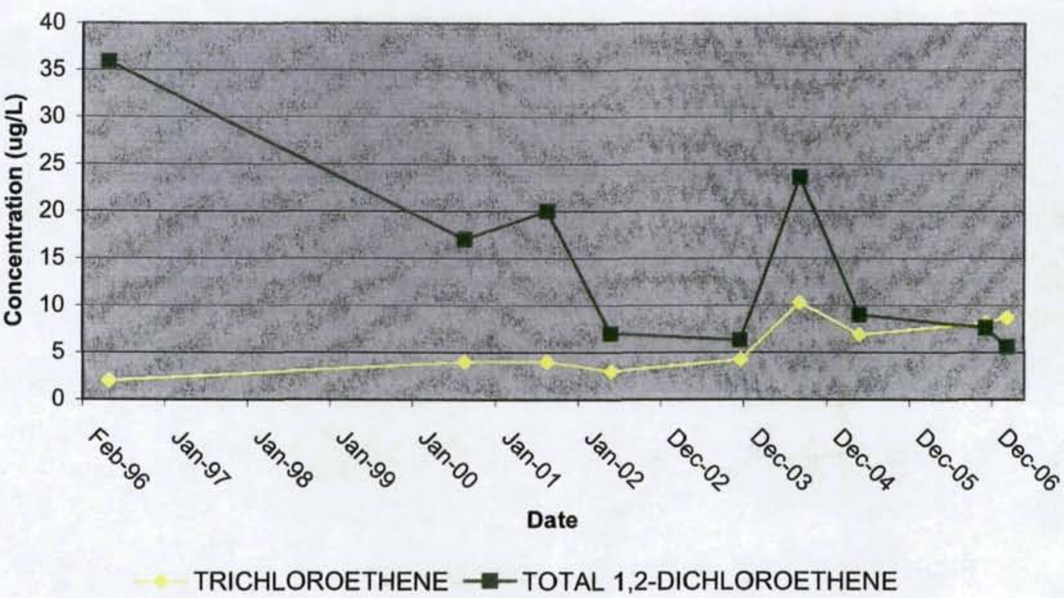
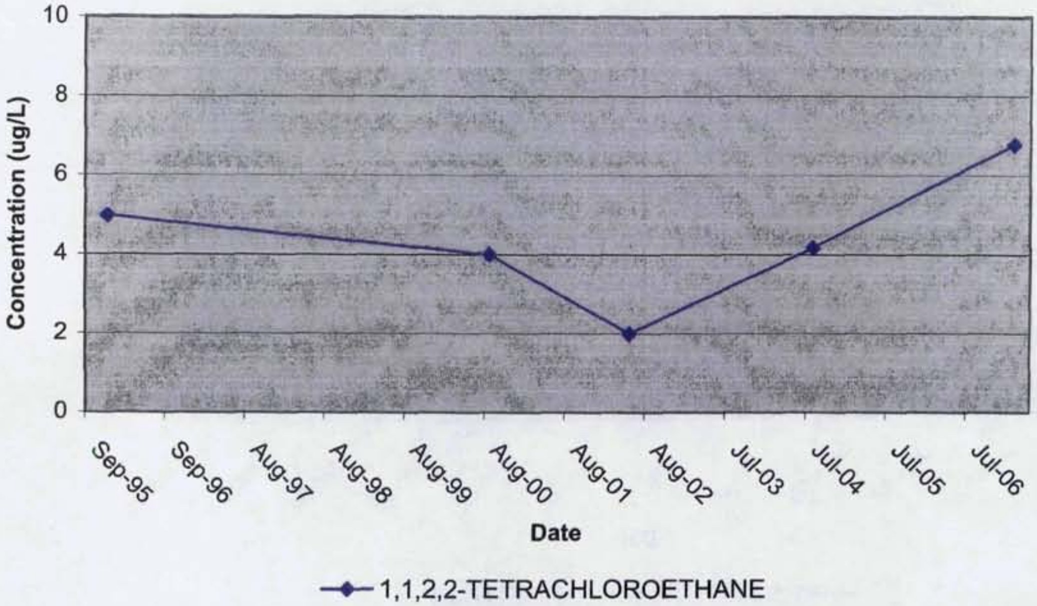


FIGURE B-8

CVOC DETECTED IN MW07-13D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



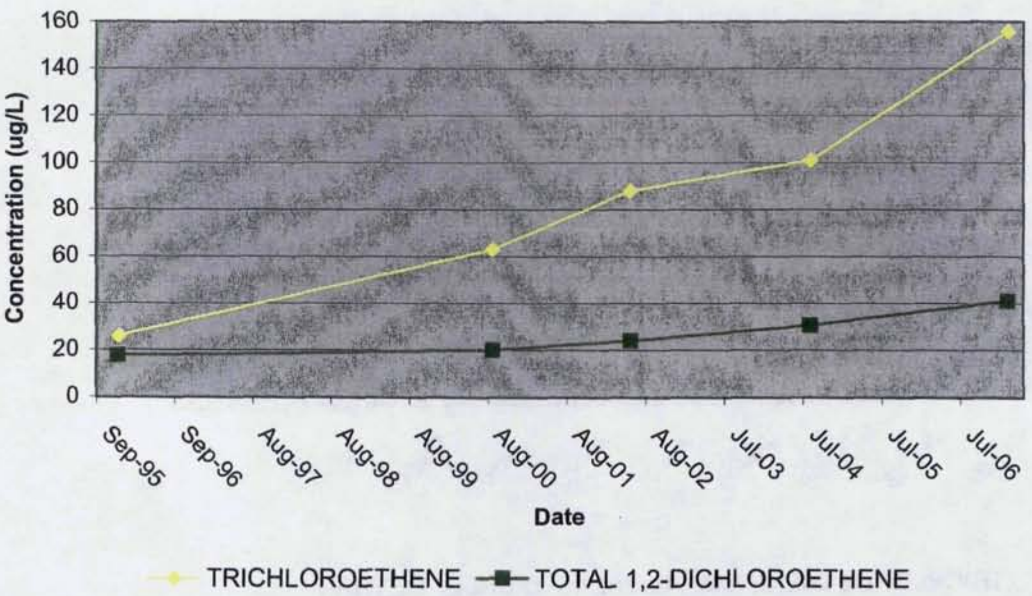
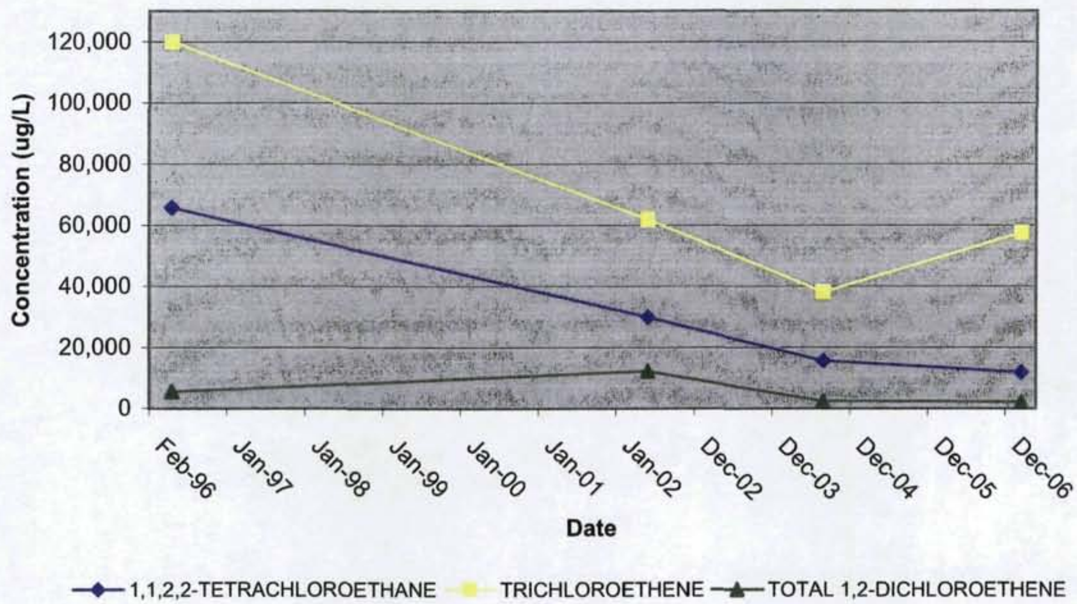


FIGURE B-9

CVOC DETECTED IN MW07-17D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



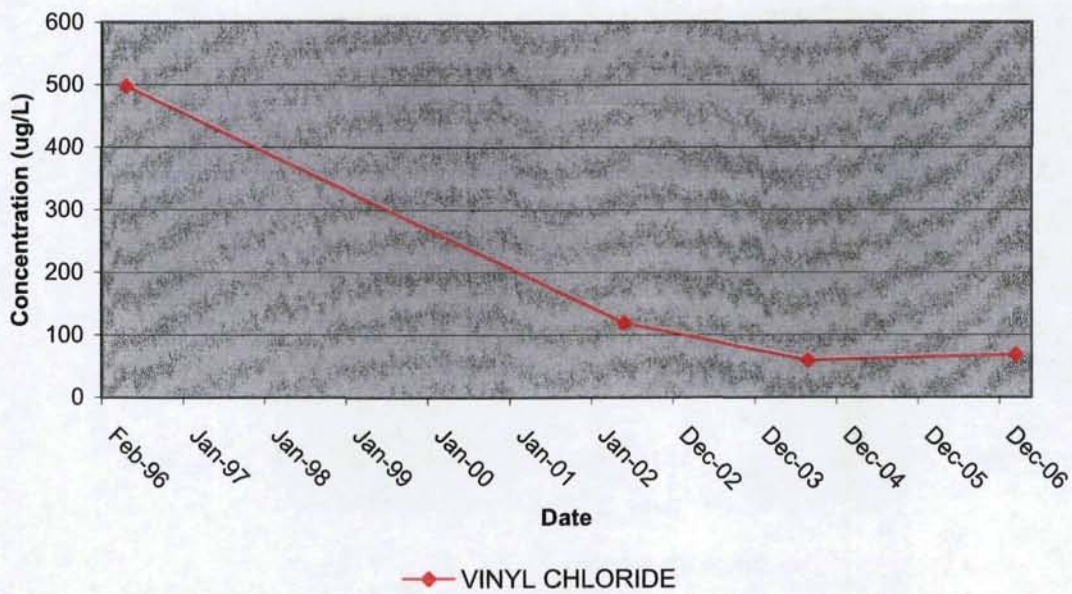
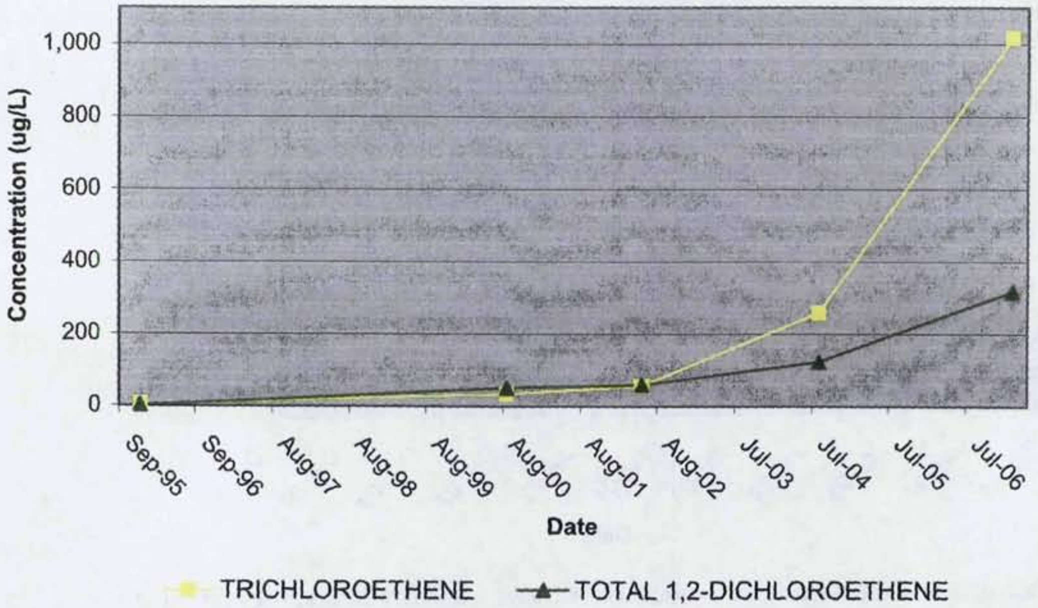


FIGURE B-10

CVOC DETECTED IN MW07-19D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



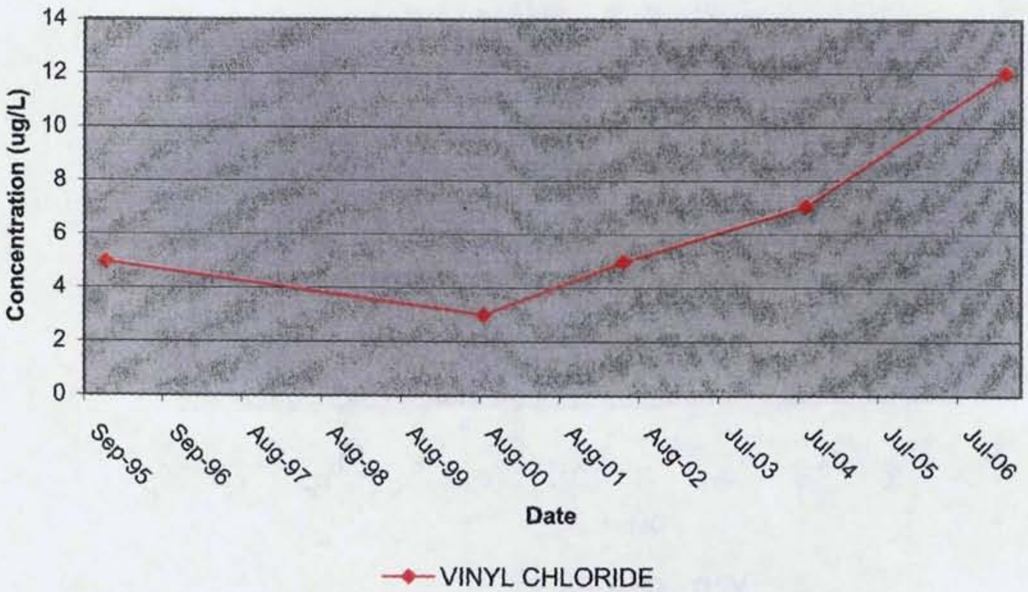
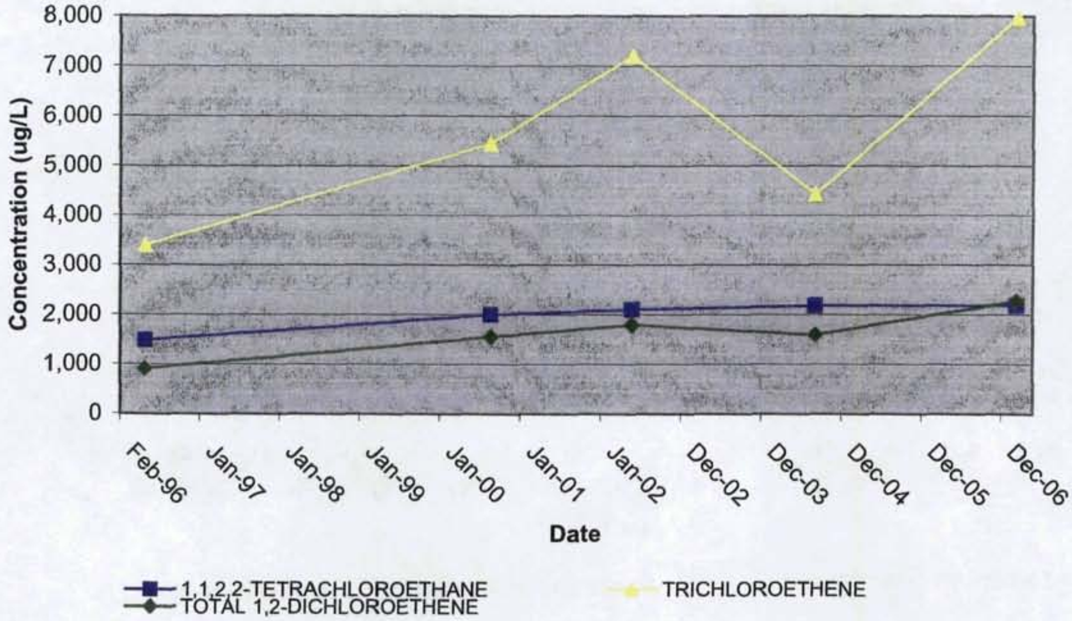


FIGURE B-11

CVOC DETECTED IN MW07-19S
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



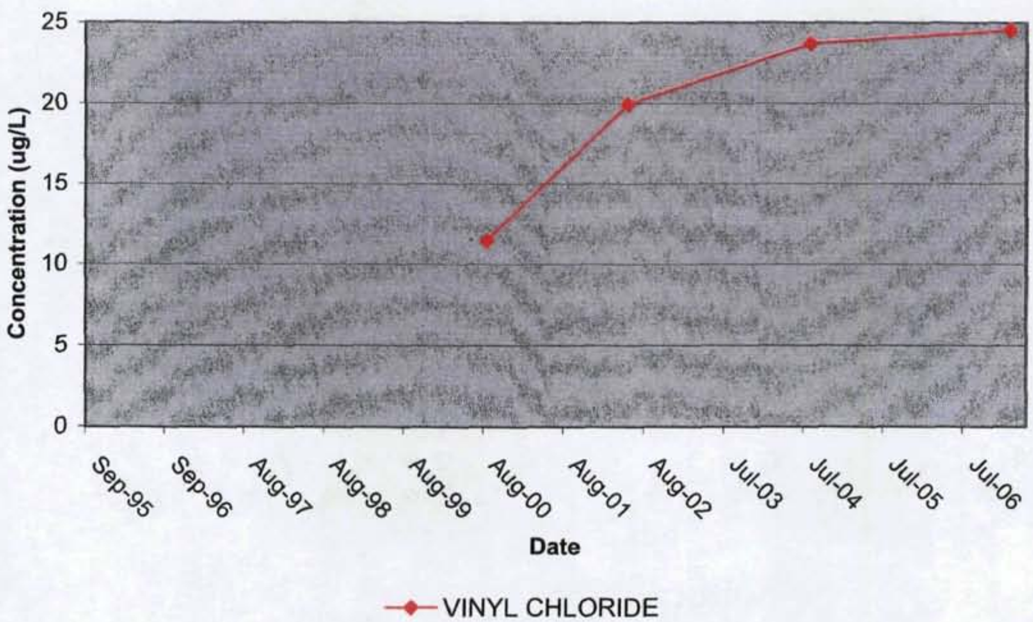
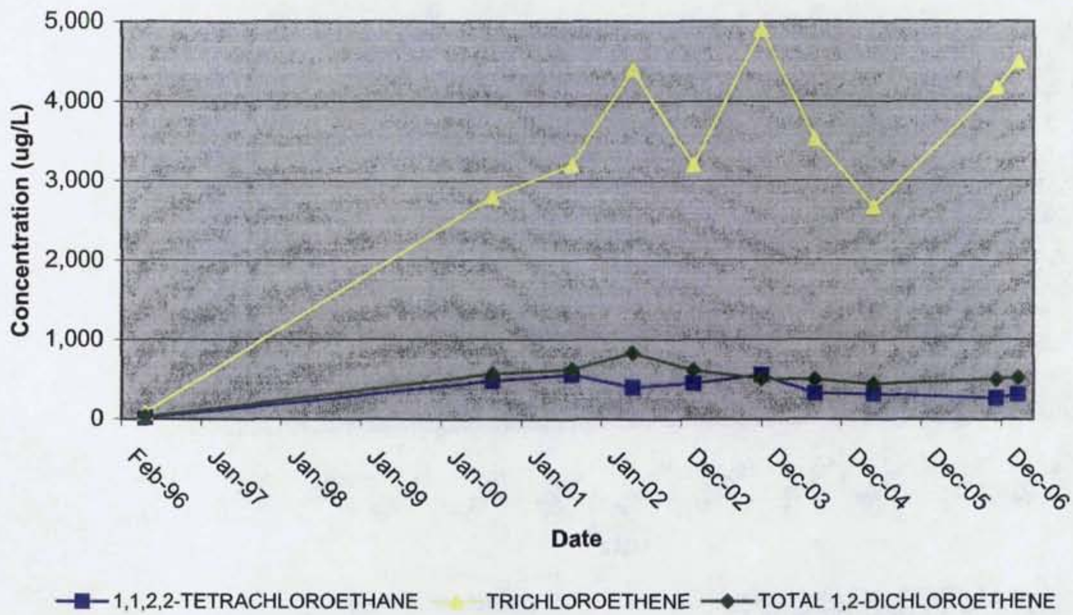


FIGURE B-12

CVOC DETECTED IN MW07-21D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



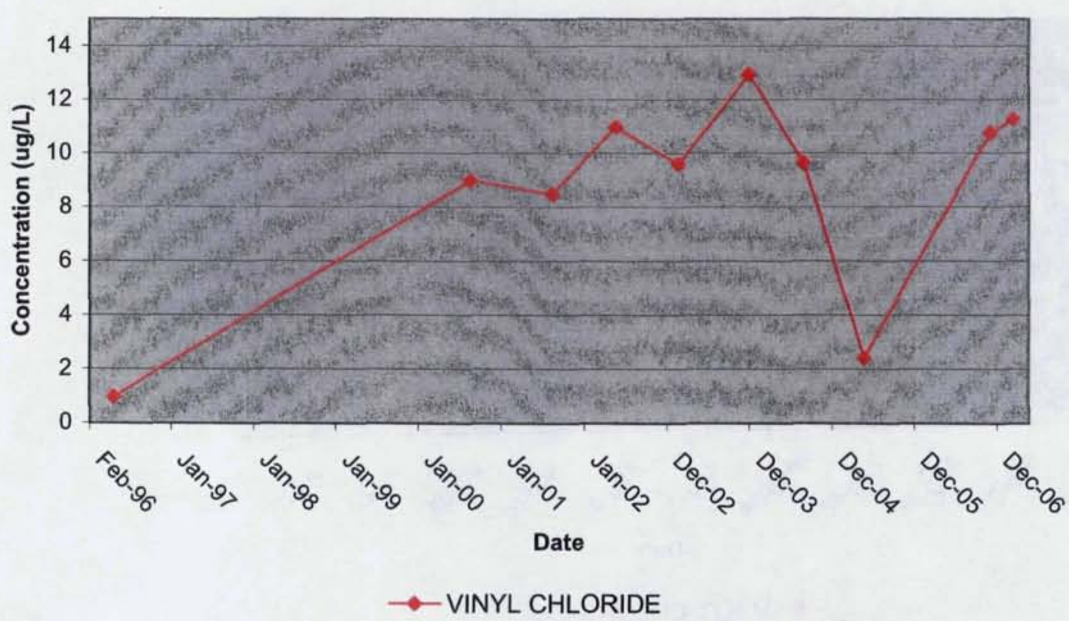
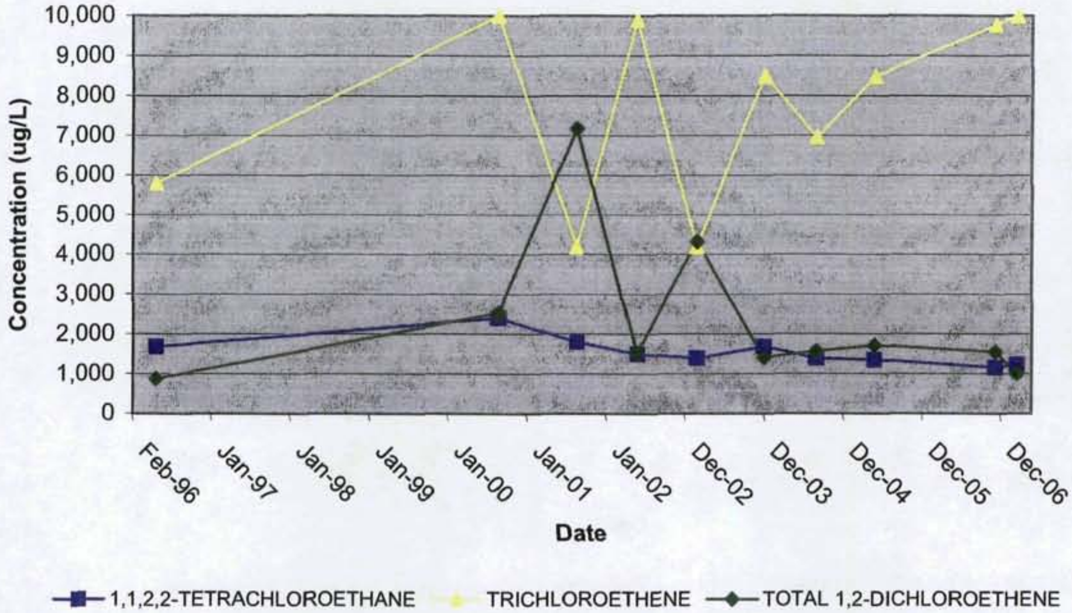


FIGURE B-13

CVOC DETECTED IN MW07-21R
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



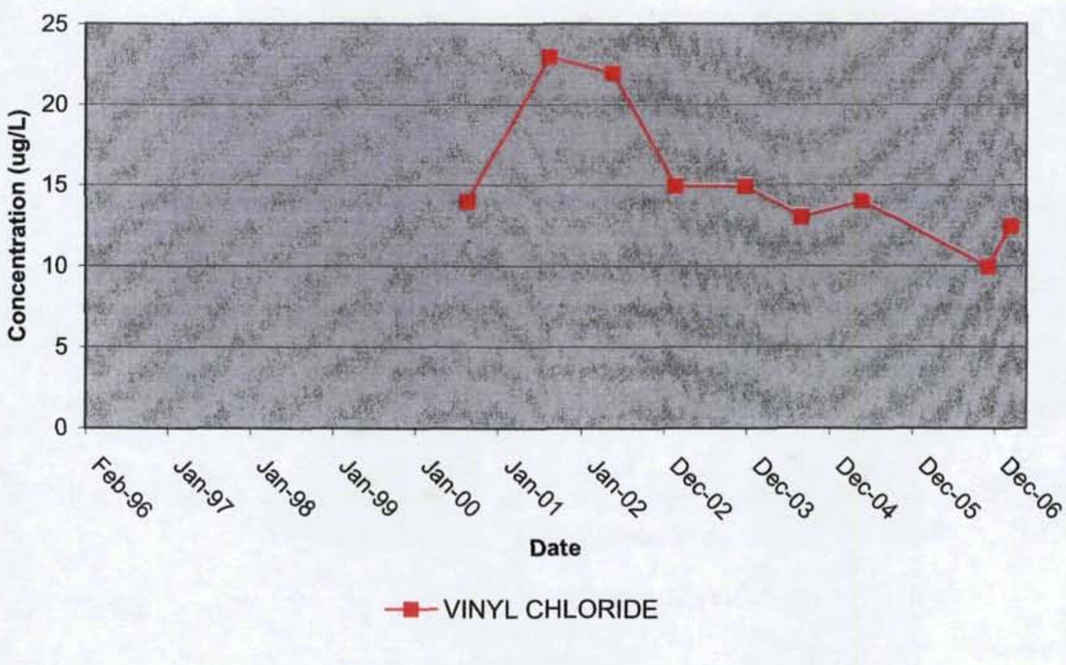
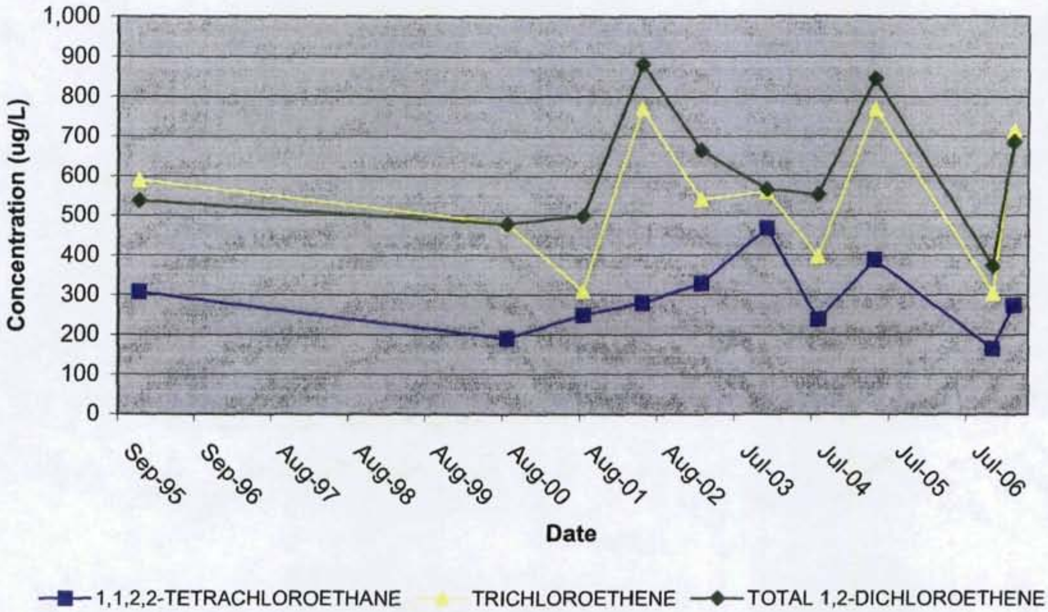


FIGURE B-14

CVOC DETECTED IN MW07-21S
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



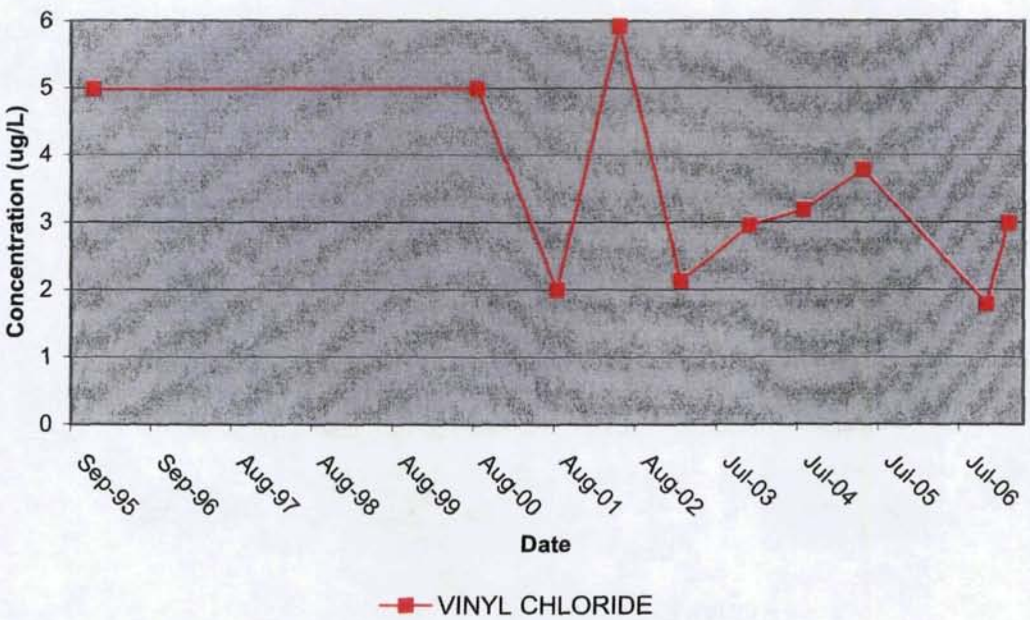
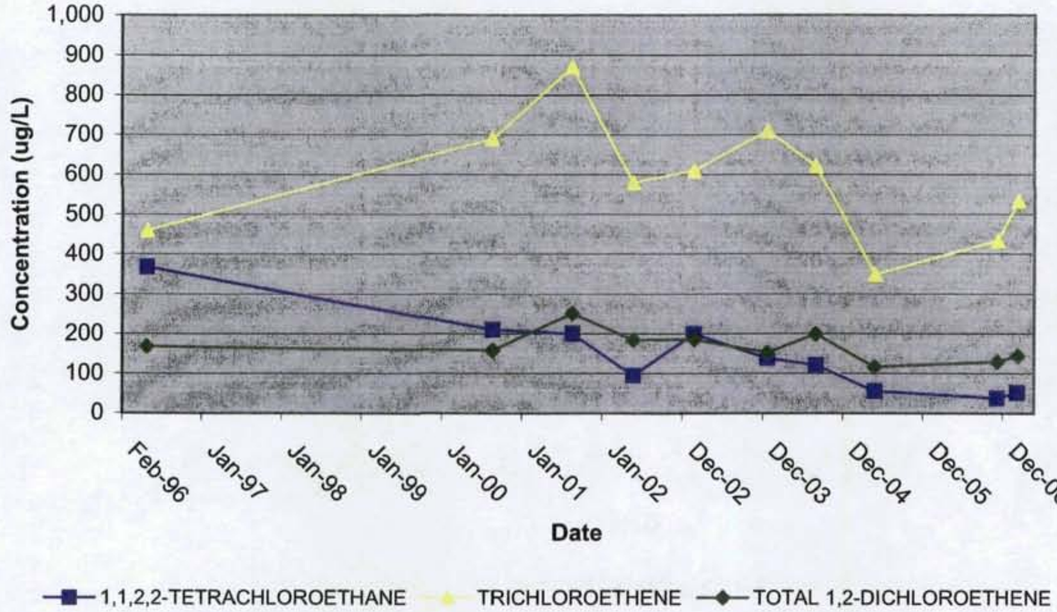


FIGURE B-15

**CVOC DETECTED IN MW07-23D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND**



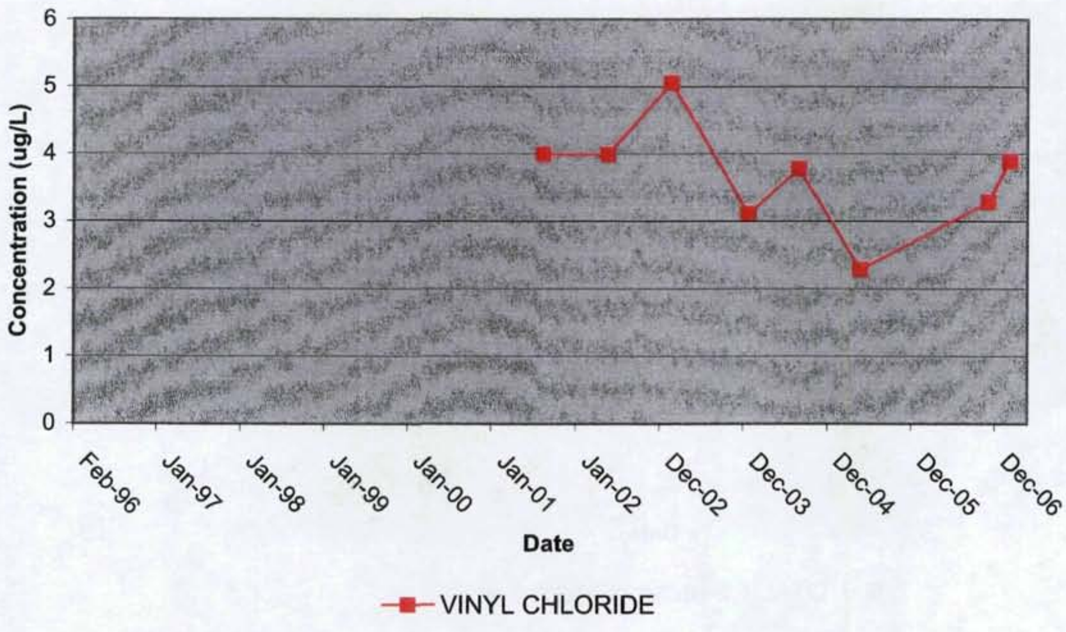
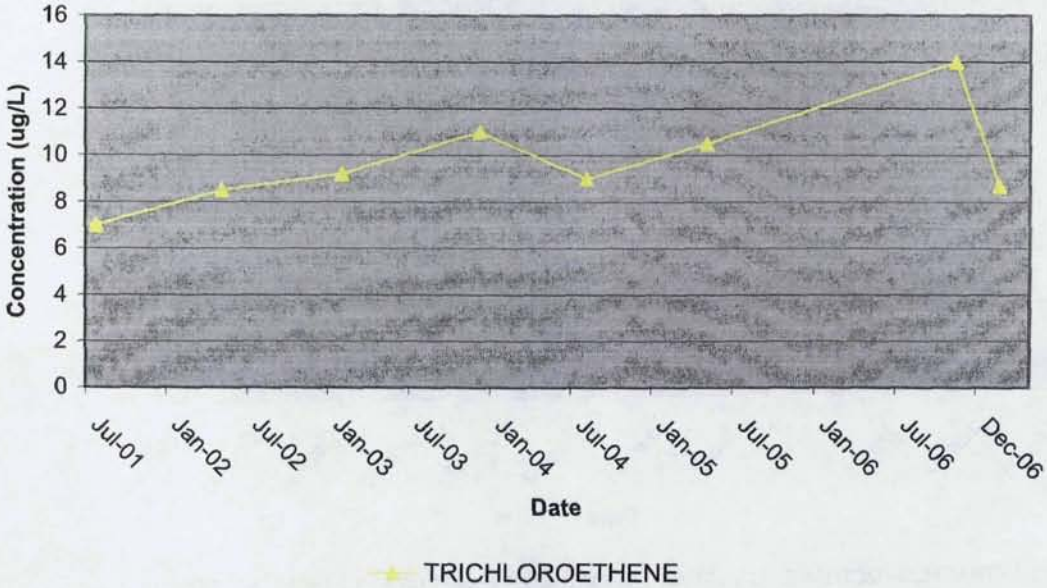


FIGURE B-16

CVOC DETECTED IN MW07-24DUT
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



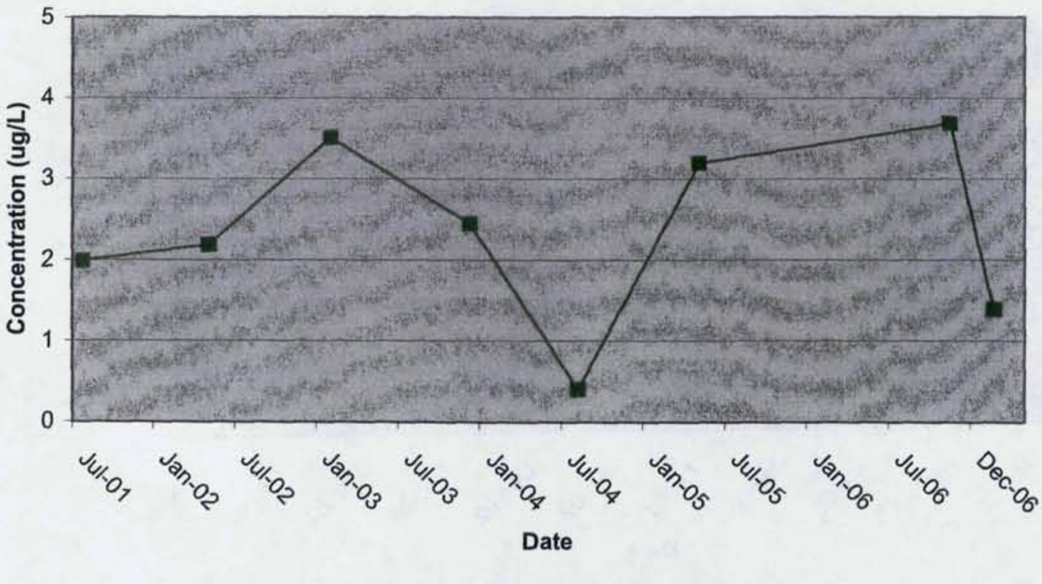
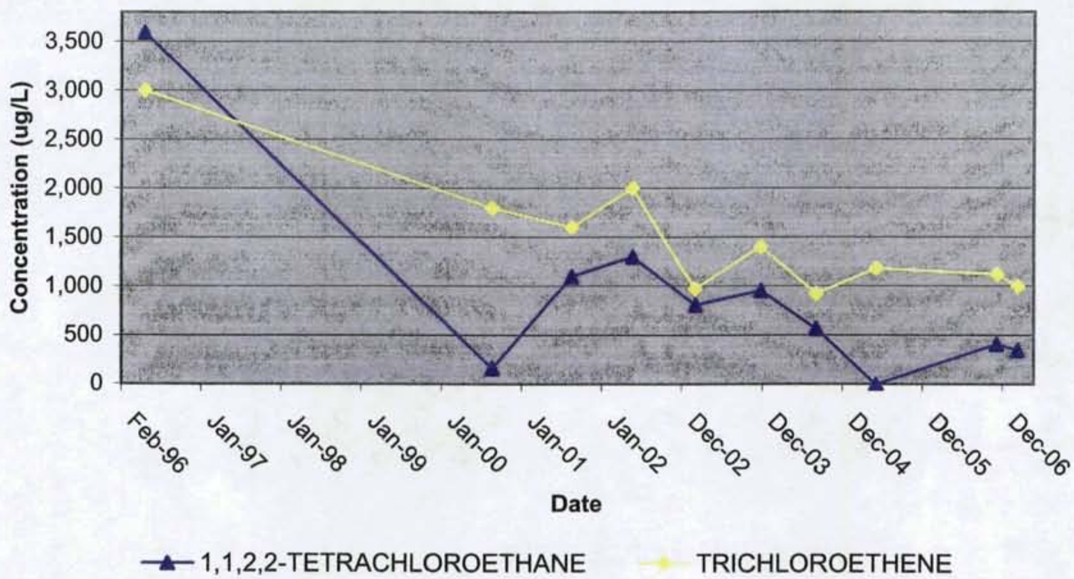


FIGURE B-17

CVOC DETECTED IN MW07-25D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



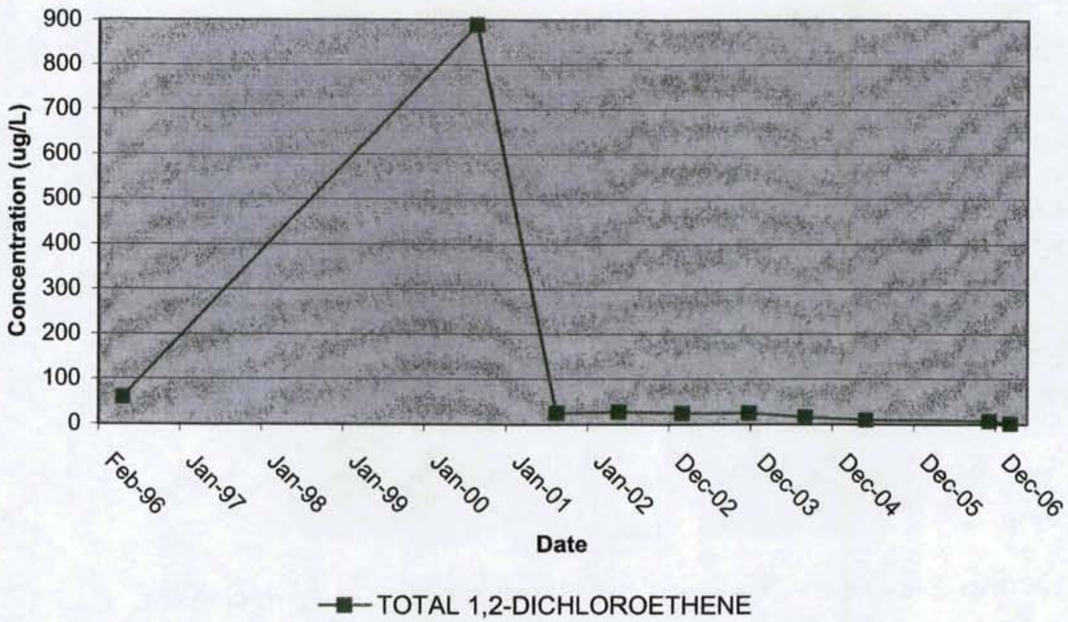
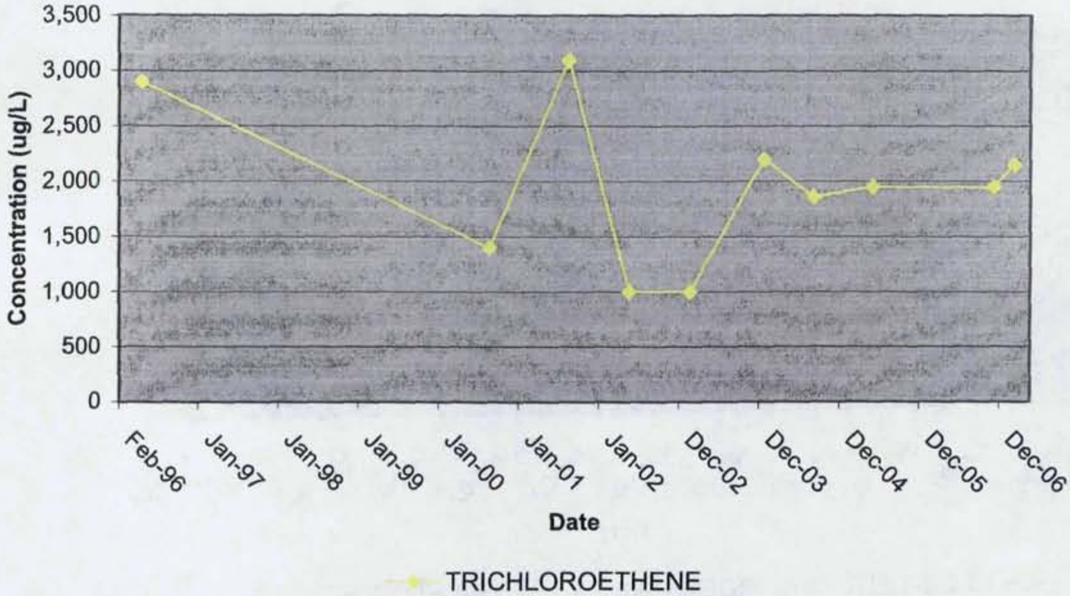


FIGURE B-18

CVOC DETECTED IN MW07-25R
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



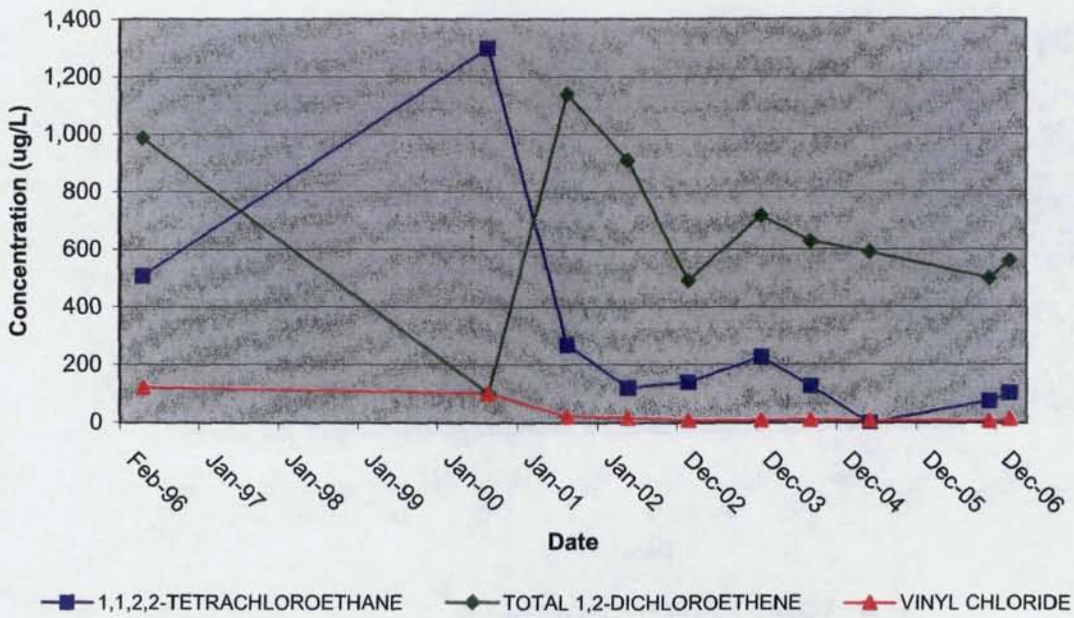
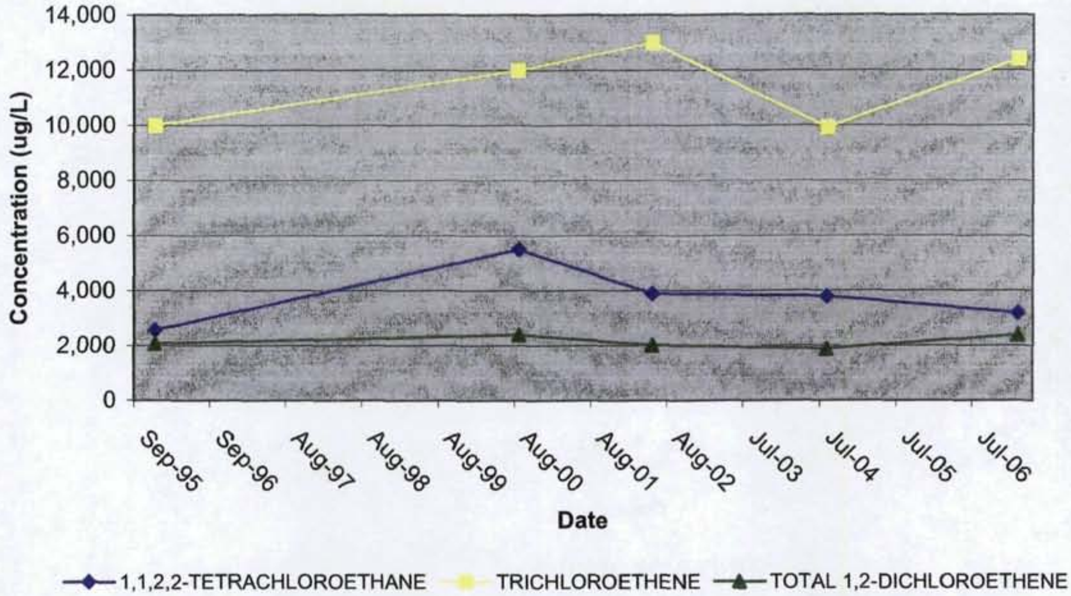


FIGURE B-19

CVOC DETECTED IN MW07-27D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



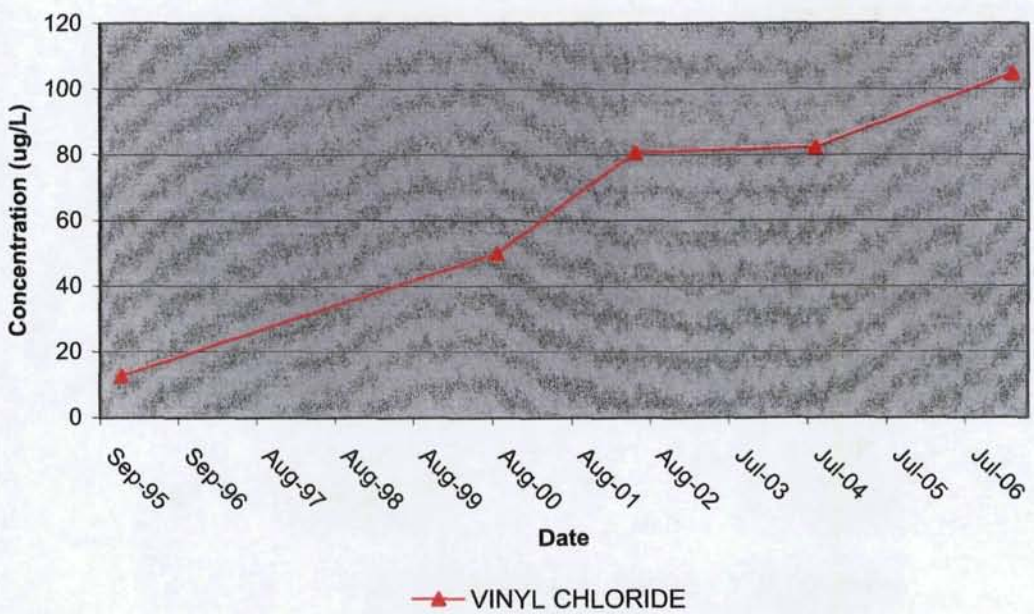
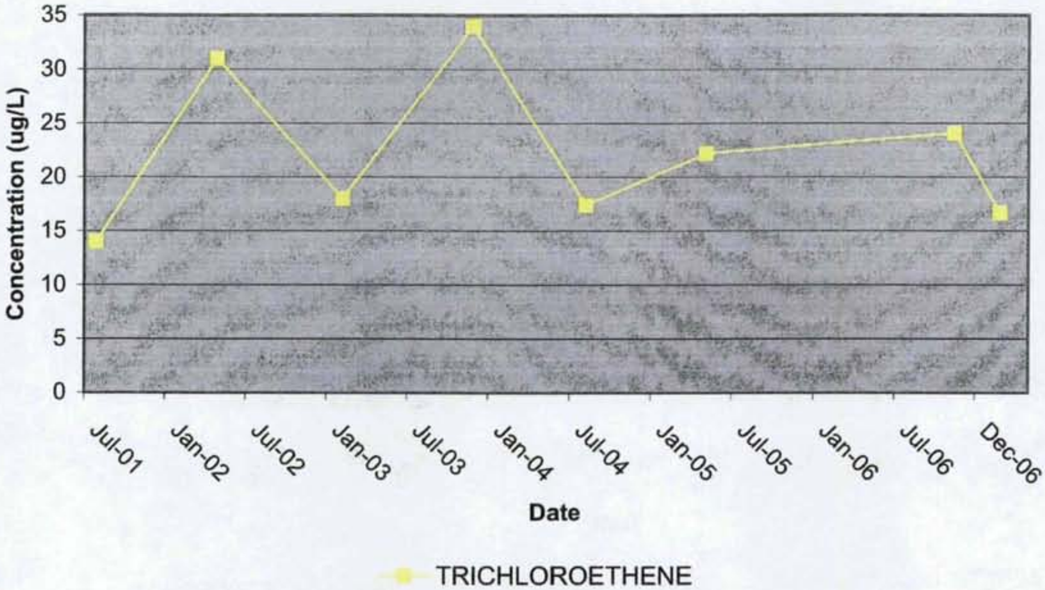


FIGURE B-20

CVOC DETECTED IN MW07-33D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



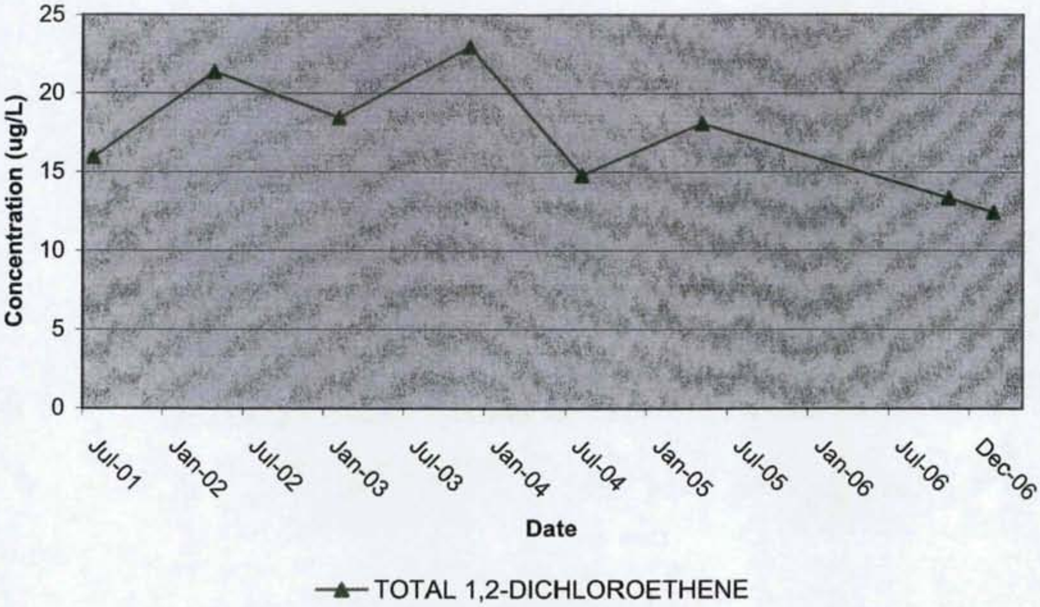
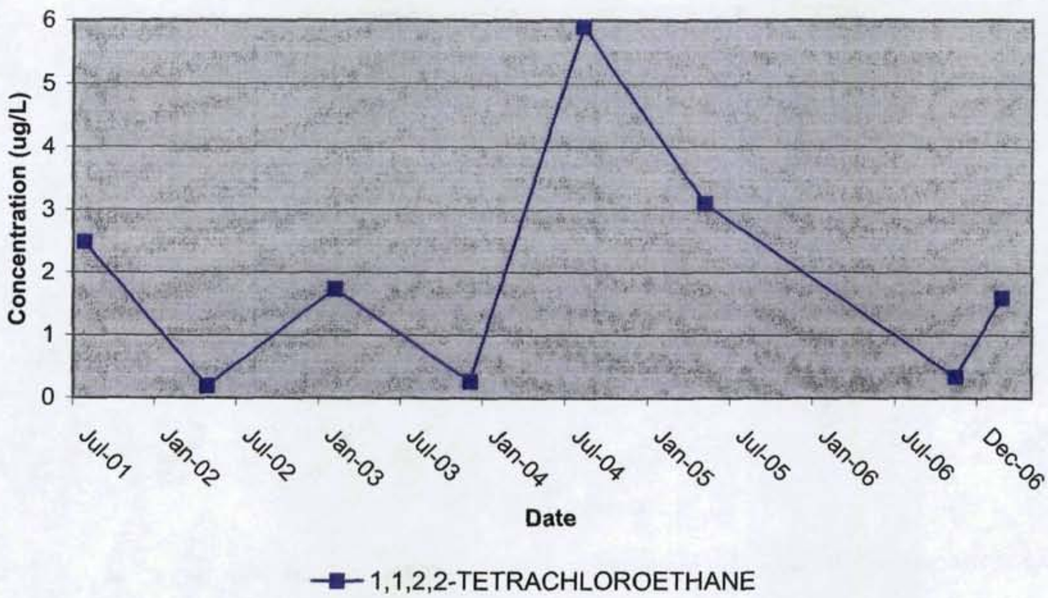


FIGURE B-21

CVOC DETECTED IN MW07-33R
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



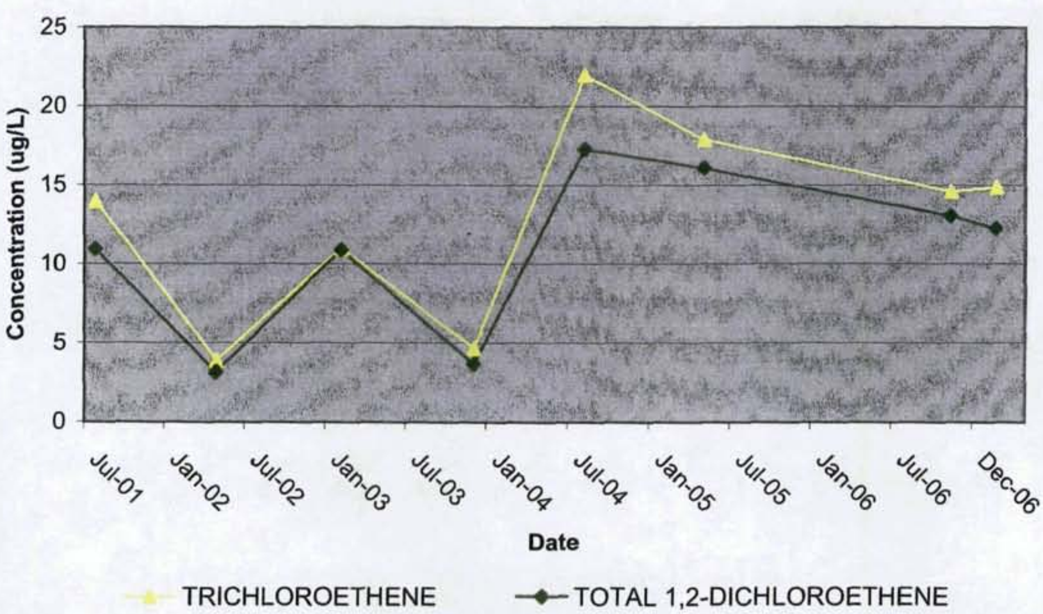
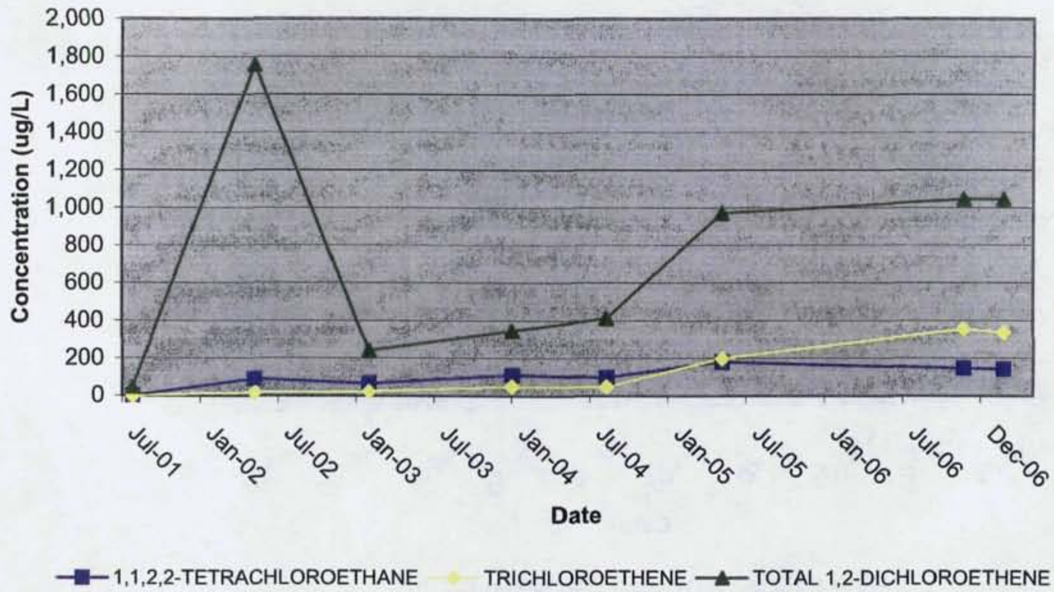


FIGURE B-22

CVOC DETECTED IN MW07-34D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



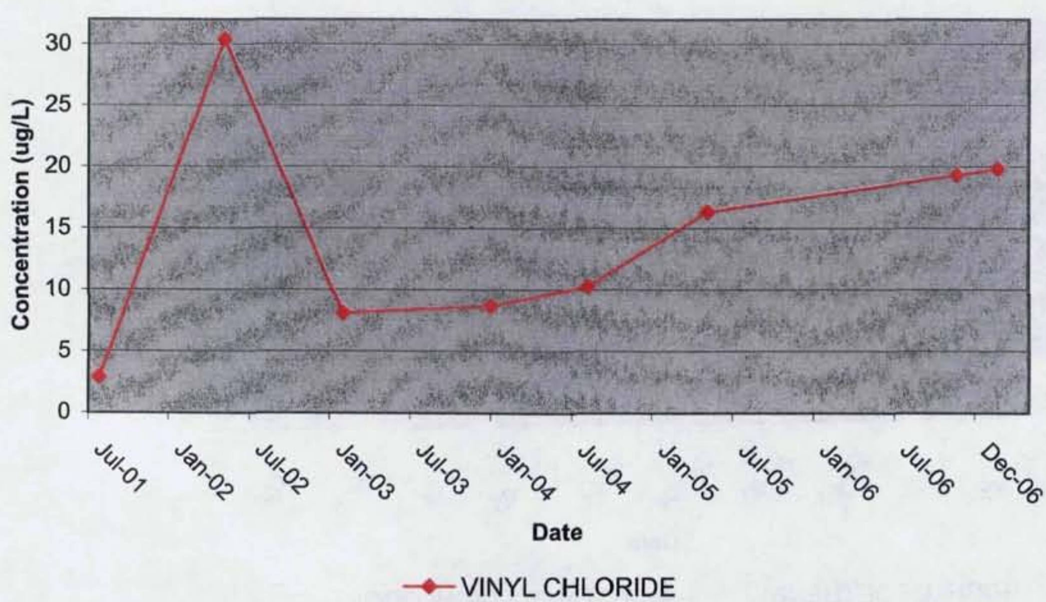
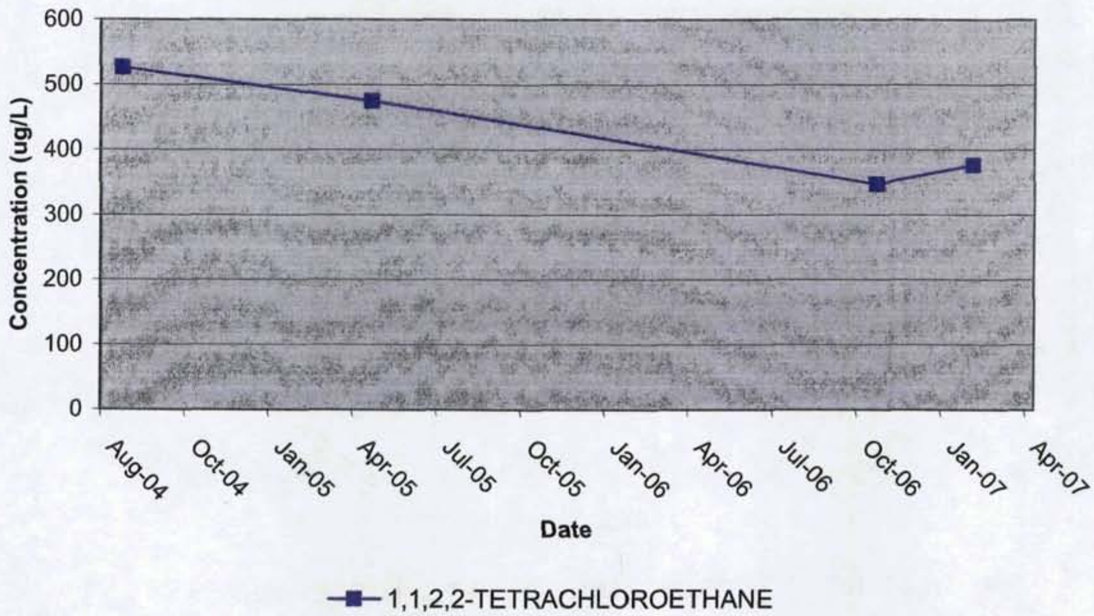


FIGURE B-23

CVOC DETECTED IN MW07-35D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



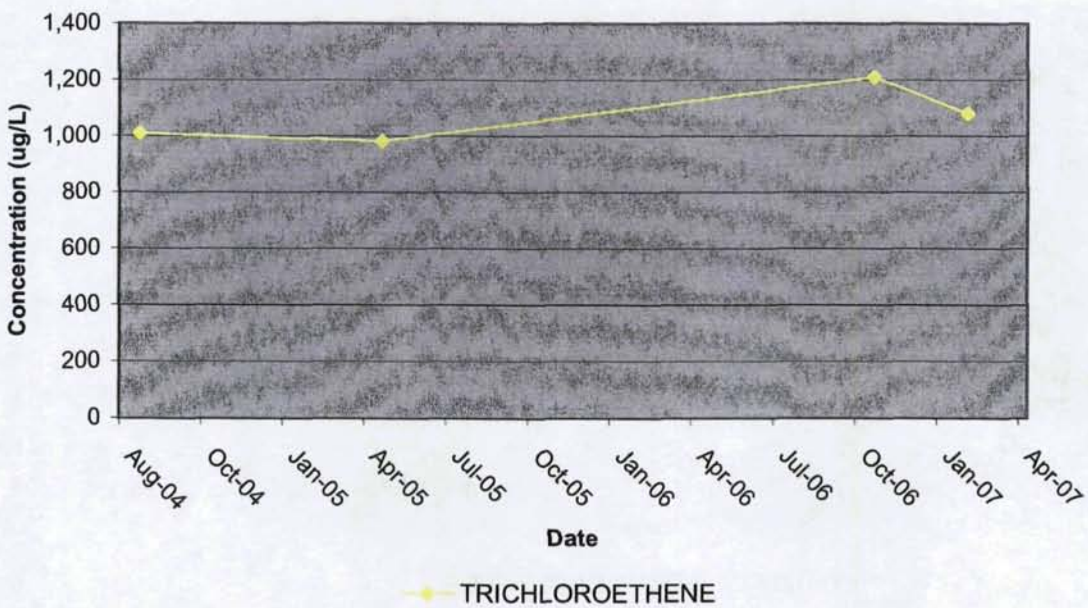
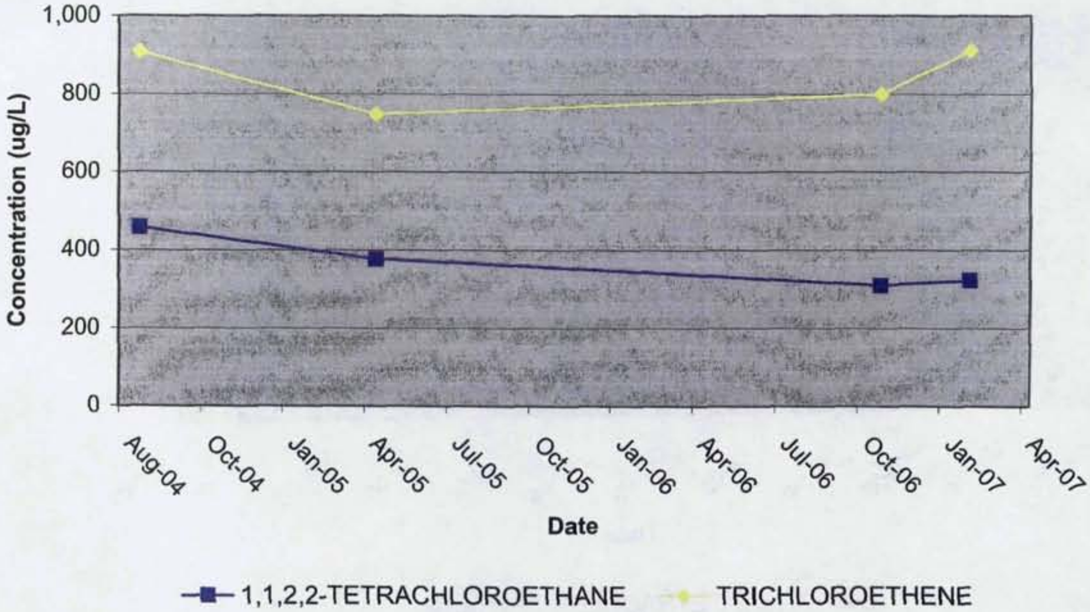


FIGURE B-24

CVOC DETECTED IN MW07-37D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



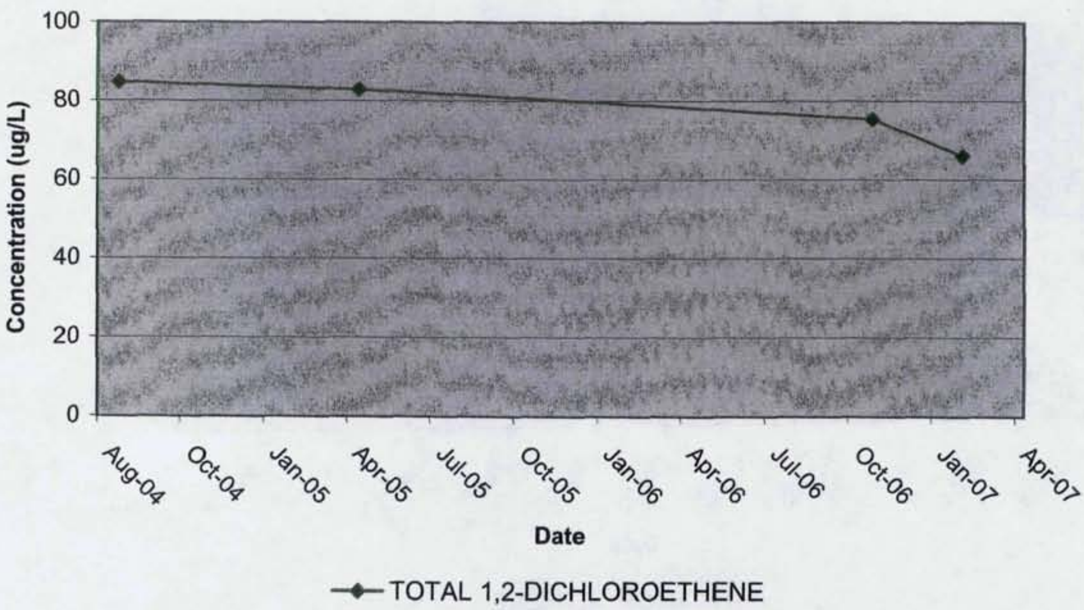
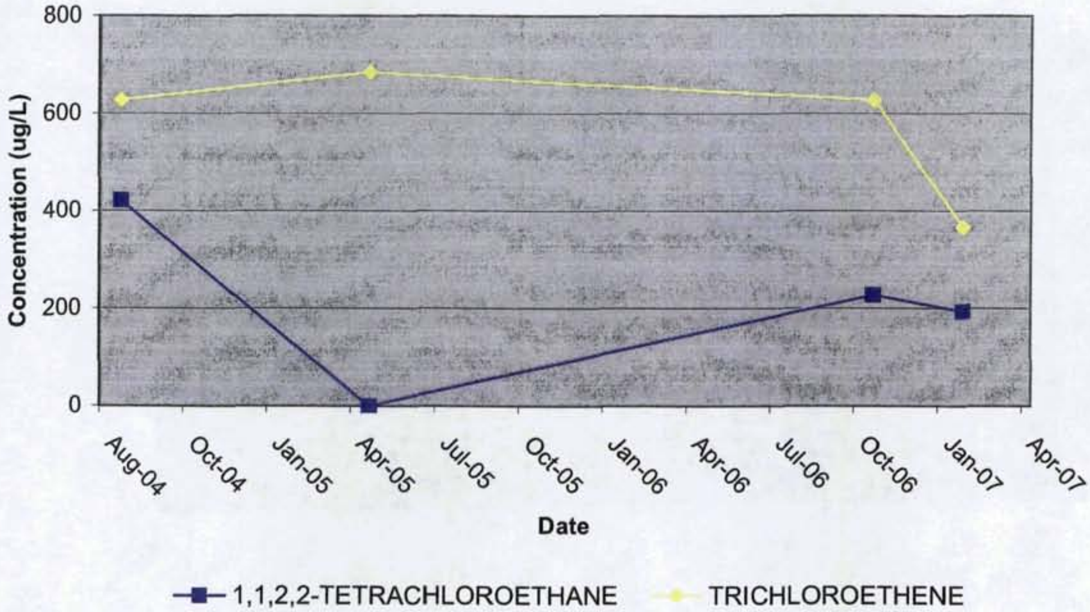


FIGURE B-25

CVOC DETECTED IN MW07-38D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



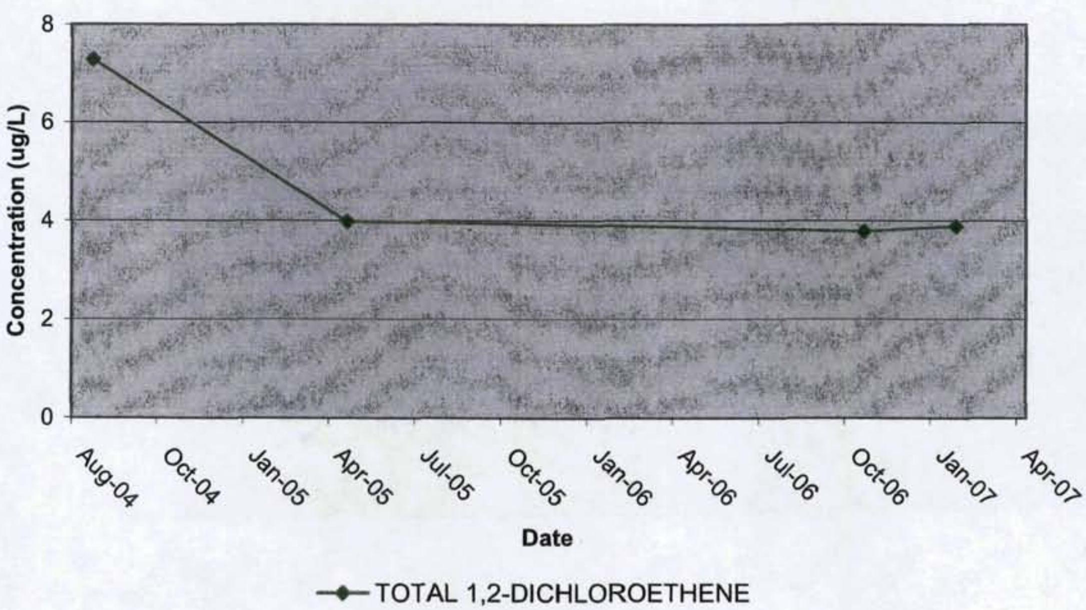
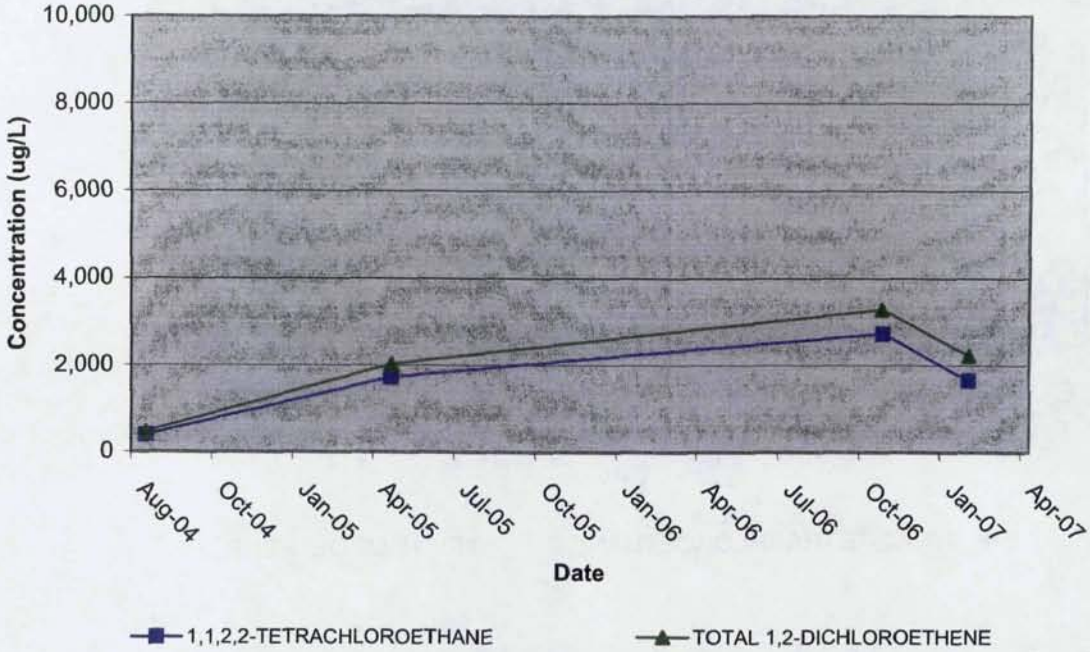


FIGURE B-26

CVOC DETECTED IN MW07-39D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND
PAGE 1 OF 2



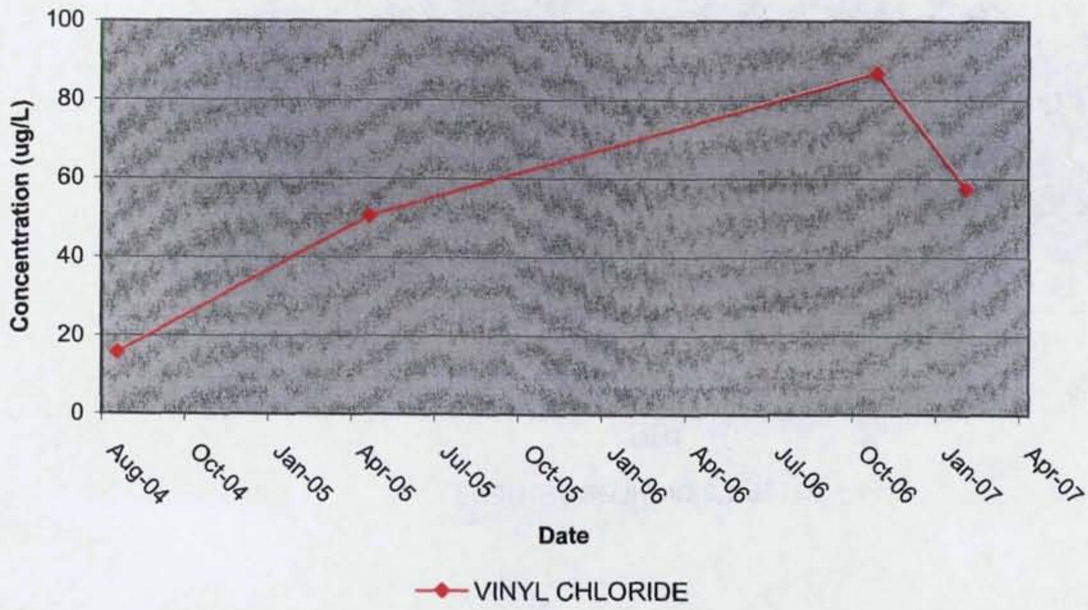


FIGURE B-26

CVOC DETECTED IN MW07-39D
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND
PAGE 2 OF 2

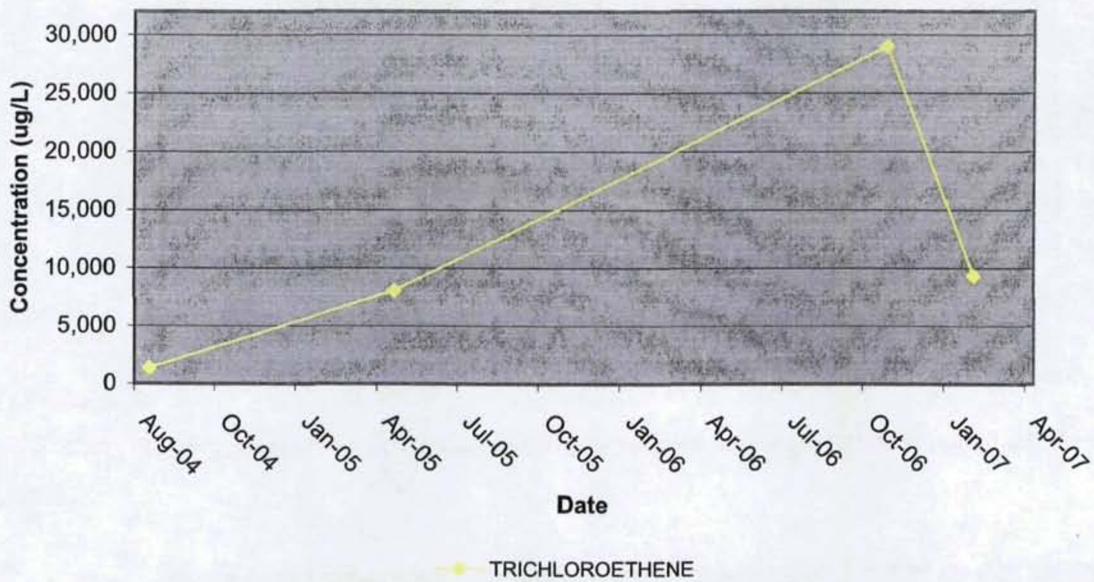
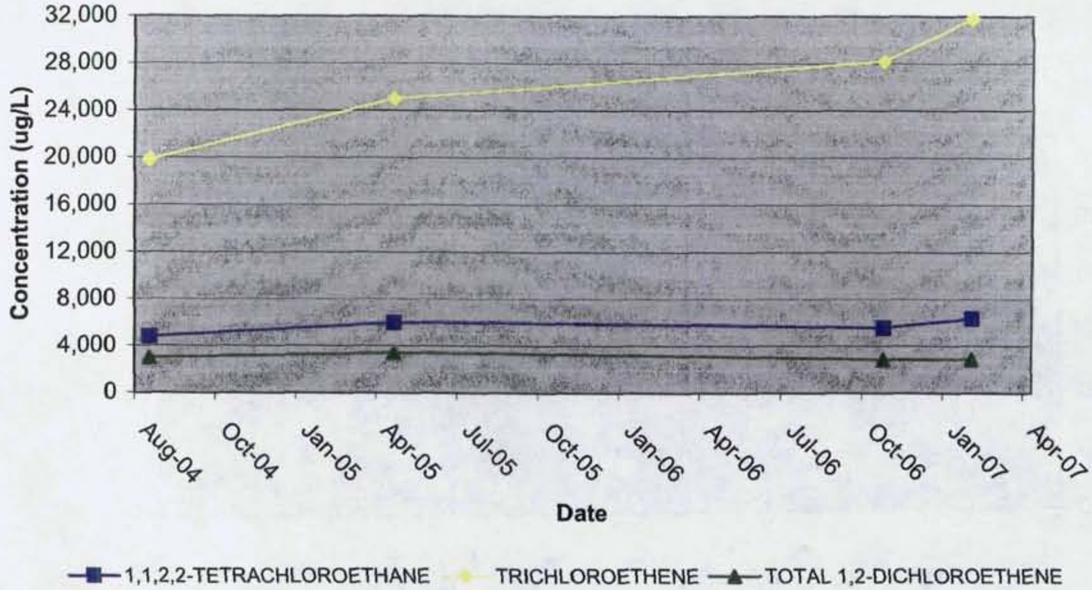


FIGURE B-27

CVOC DETECTED IN MW07-39I
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



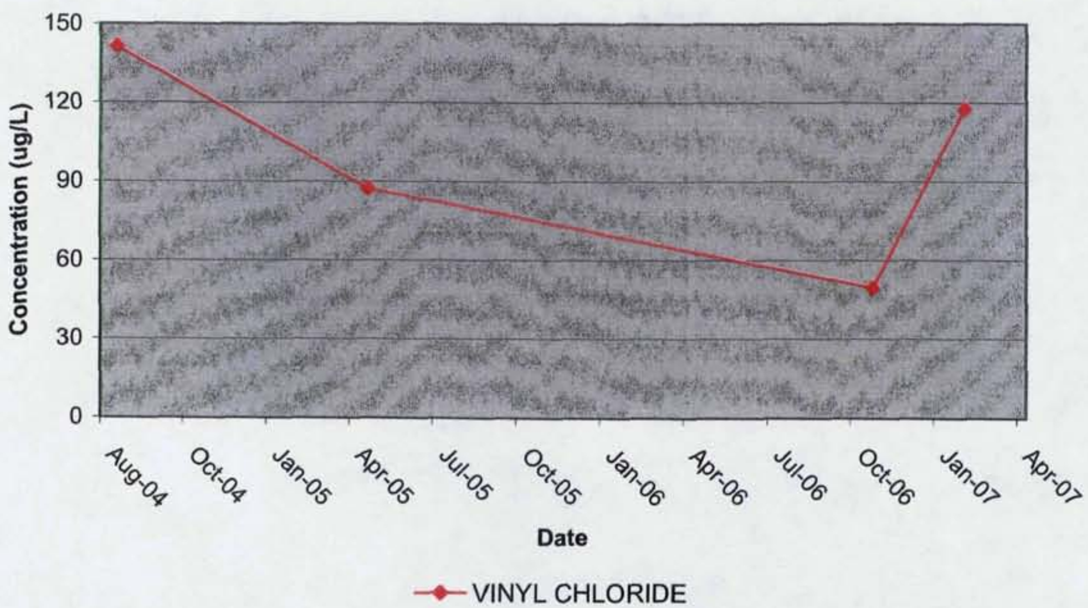
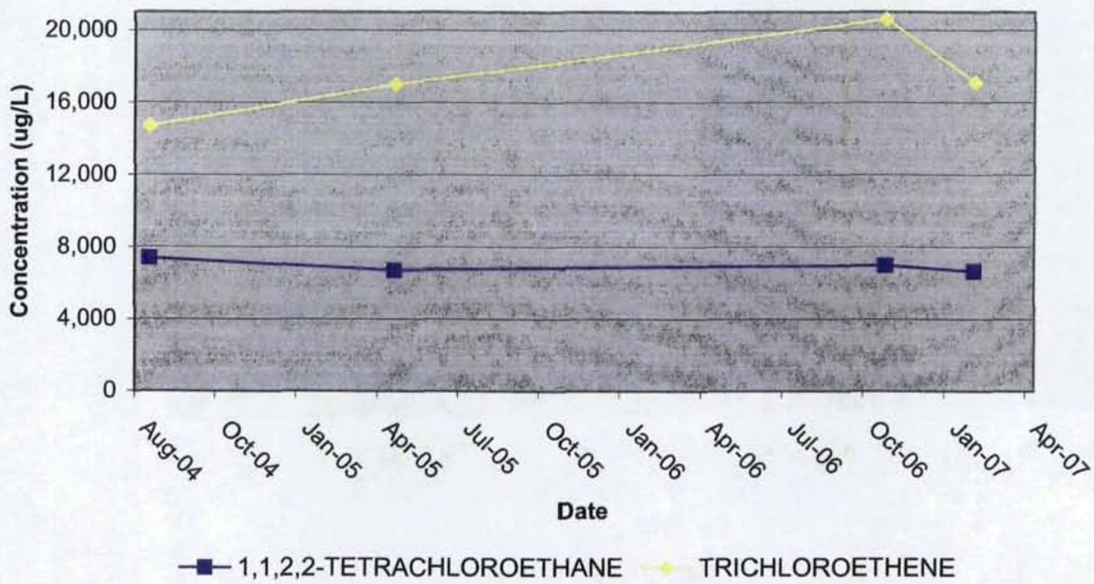


FIGURE B-28

CVOC DETECTED IN MW07-39S
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



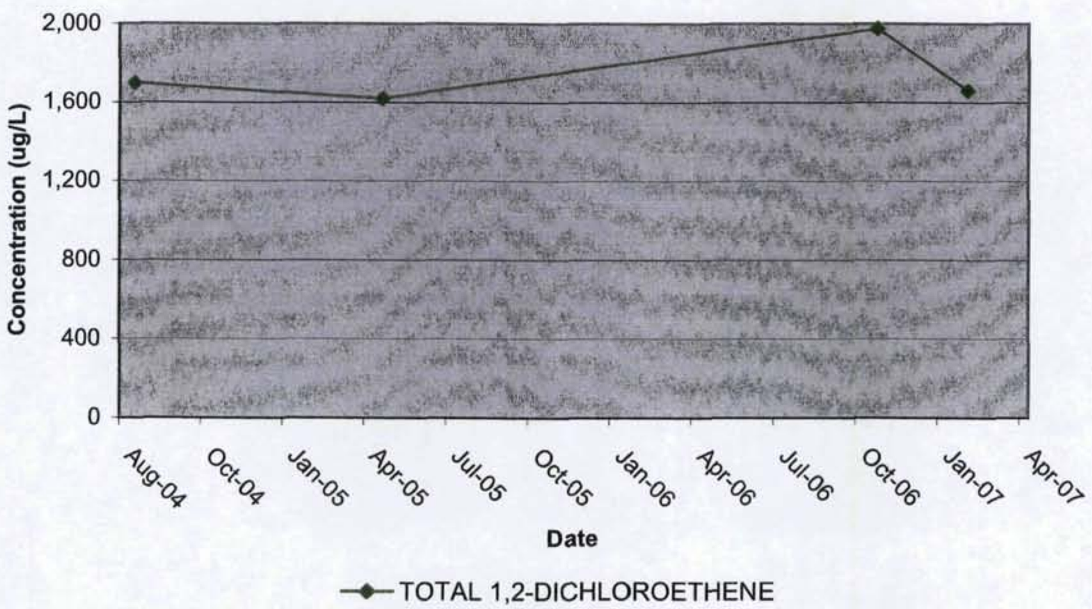


FIGURE B-29

CVOC DETECTED IN P07-04
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

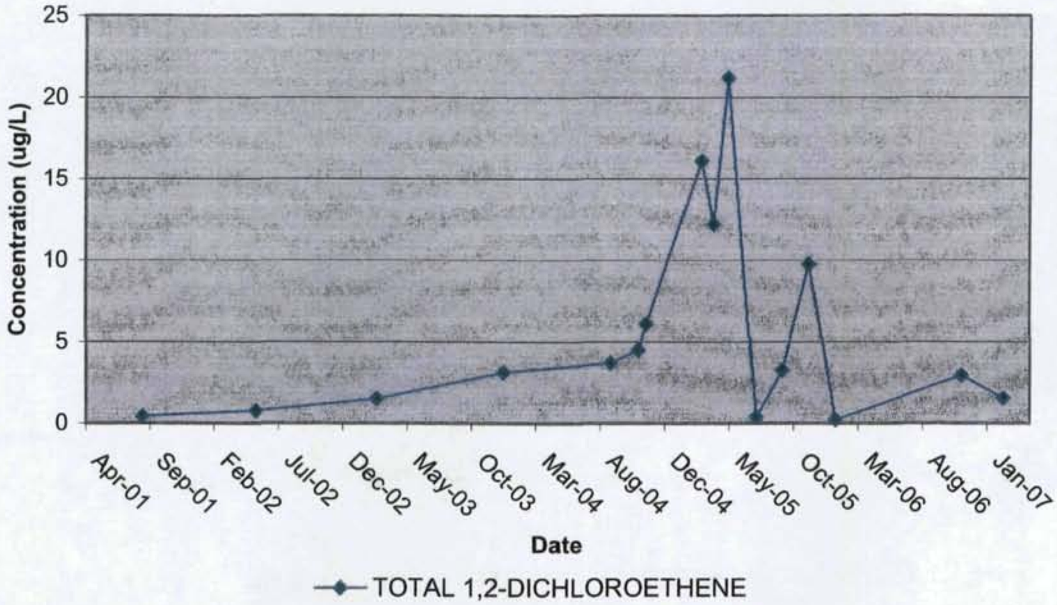
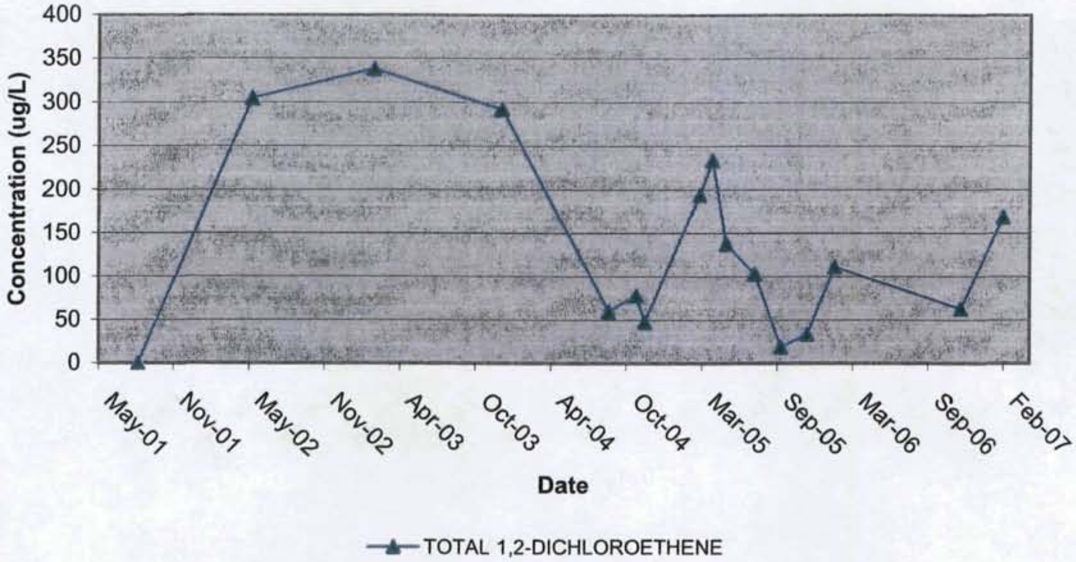


FIGURE B-30

CVOC DETECTED IN P07-05
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



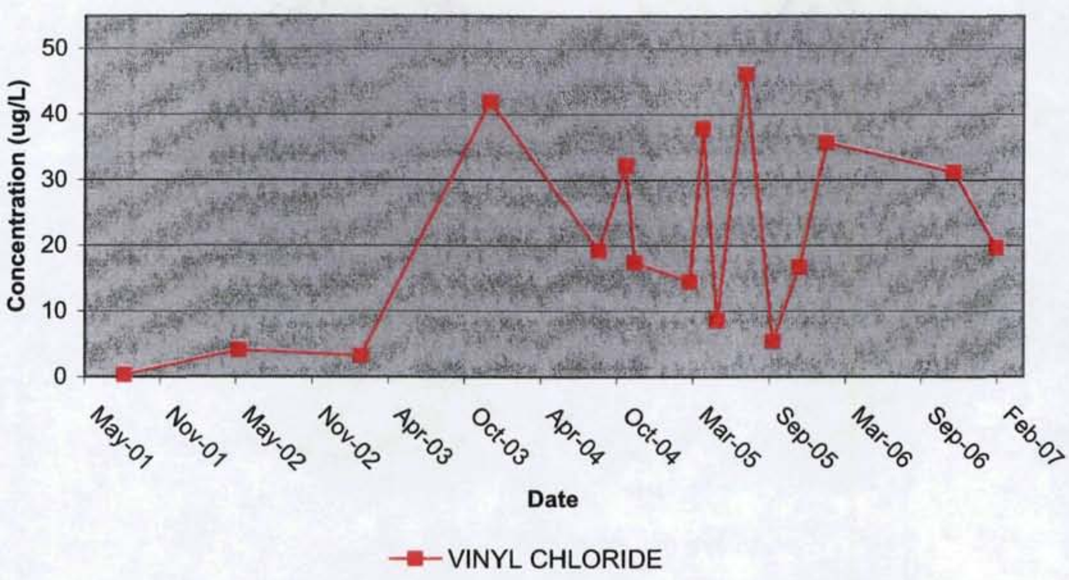
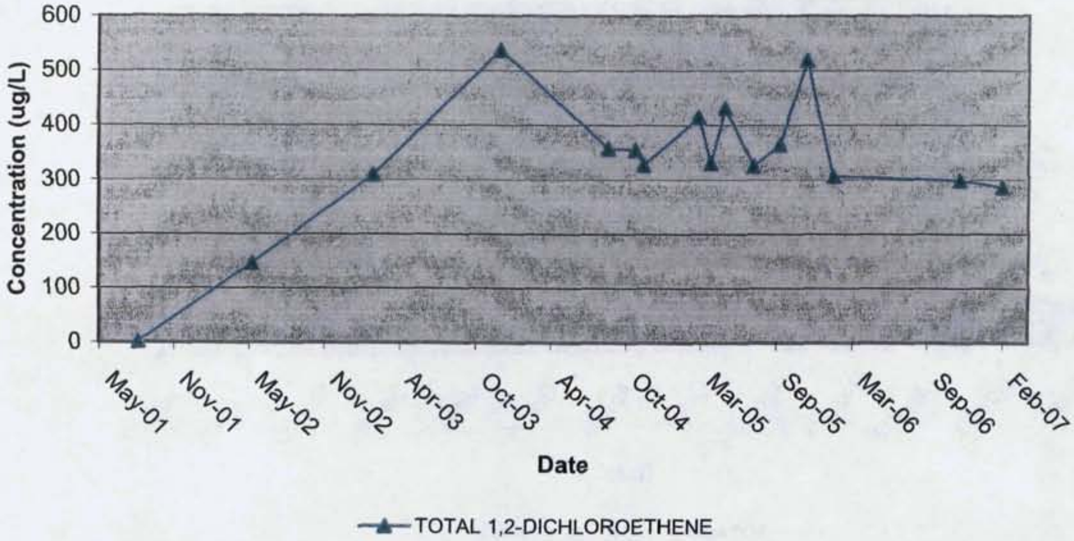


FIGURE B-31

CVOC DETECTED IN P07-06
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



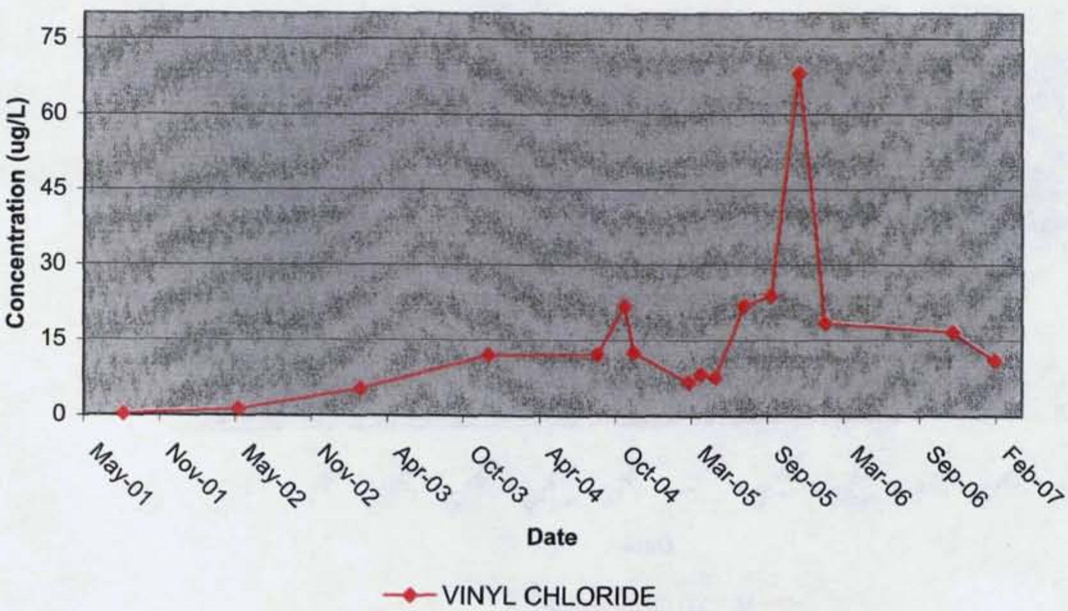
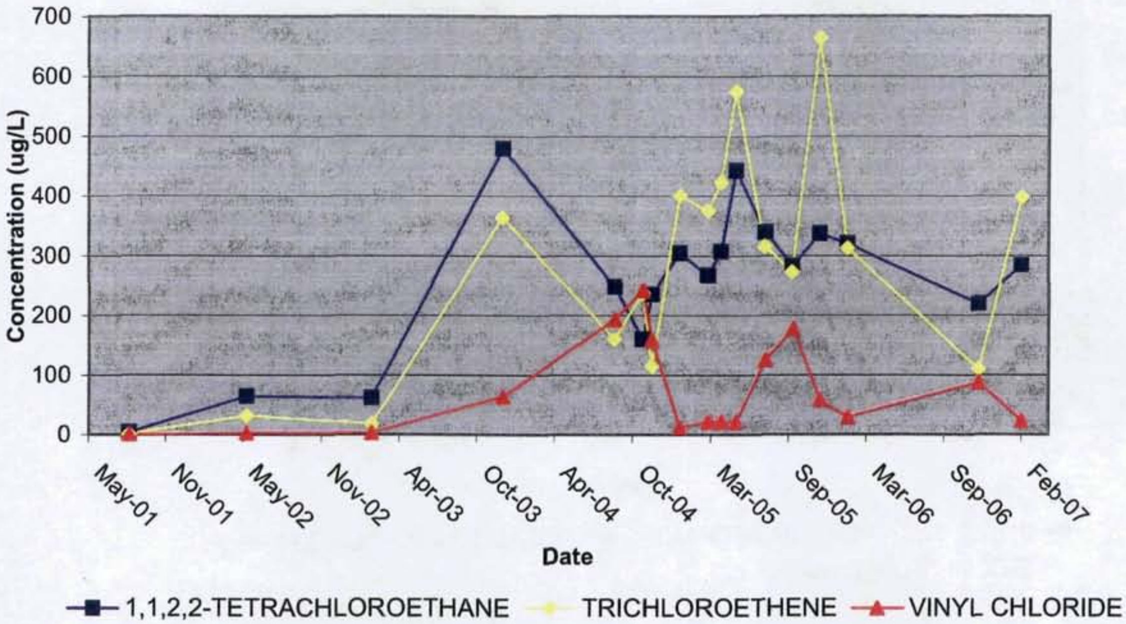


FIGURE B-32

CVOC DETECTED IN P07-07
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



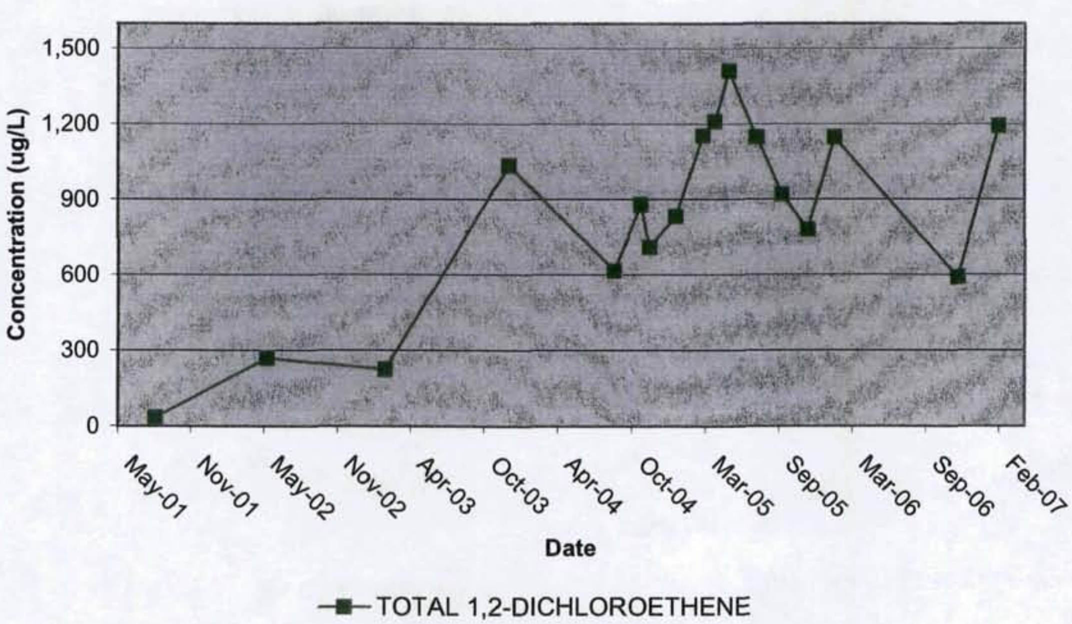
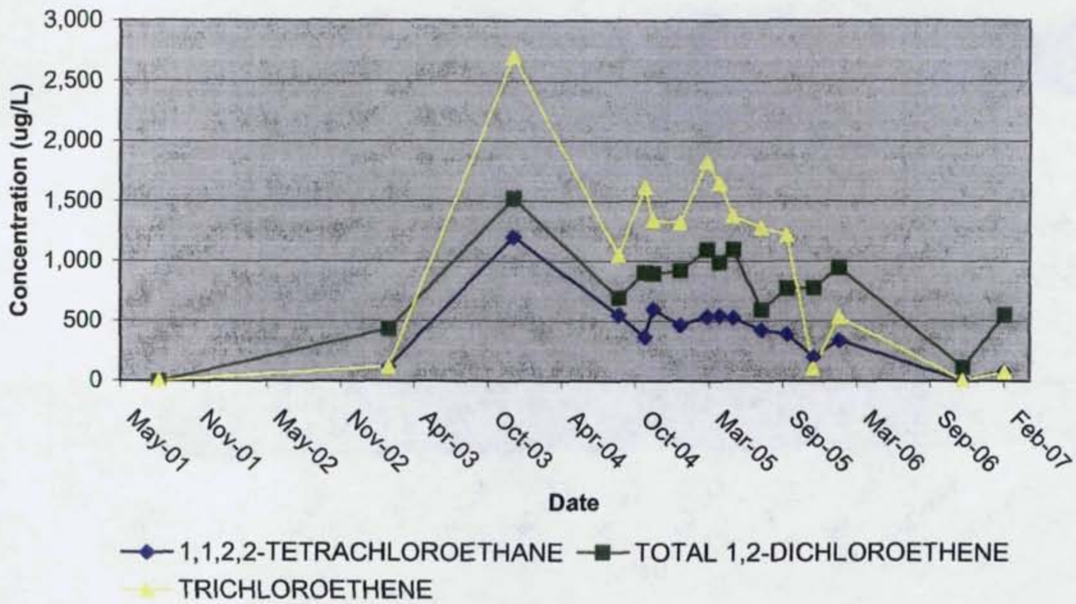


FIGURE B-33

CVOC DETECTED IN P07-08
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



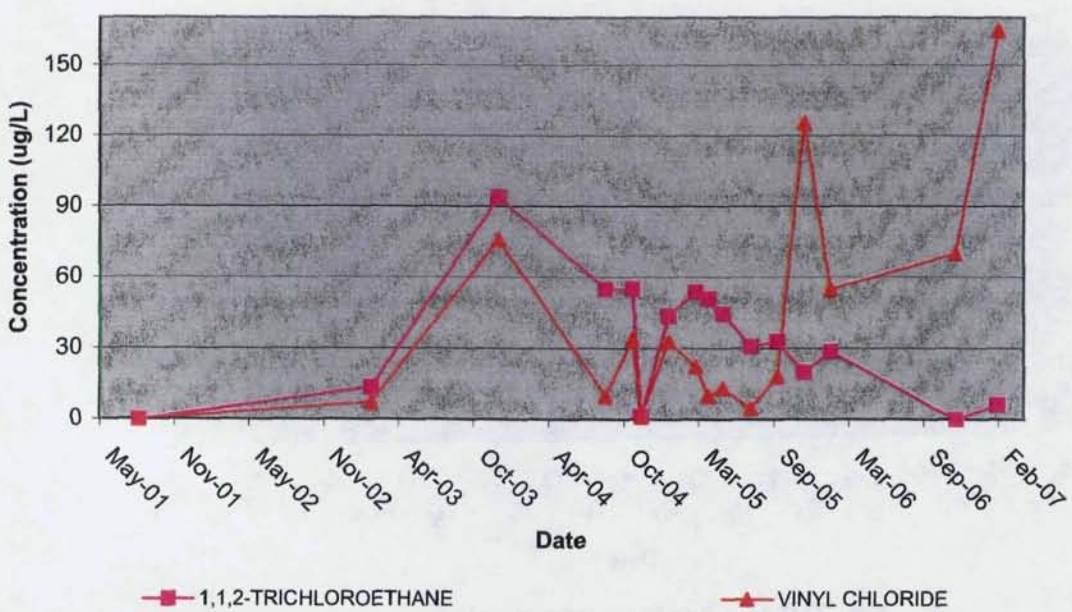
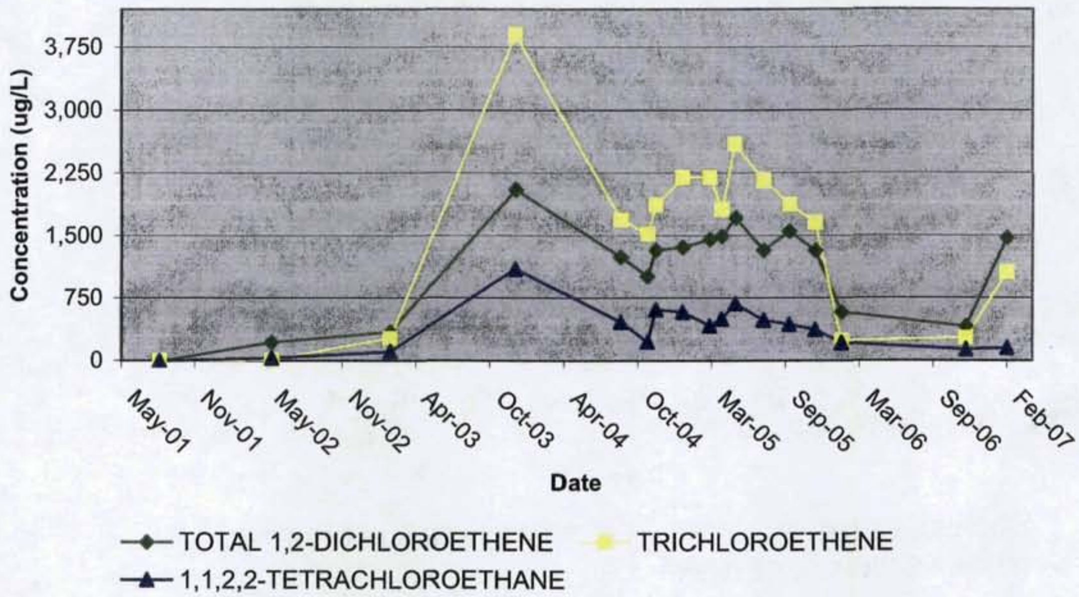


FIGURE B-34

CVOC DETECTED IN P07-09
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



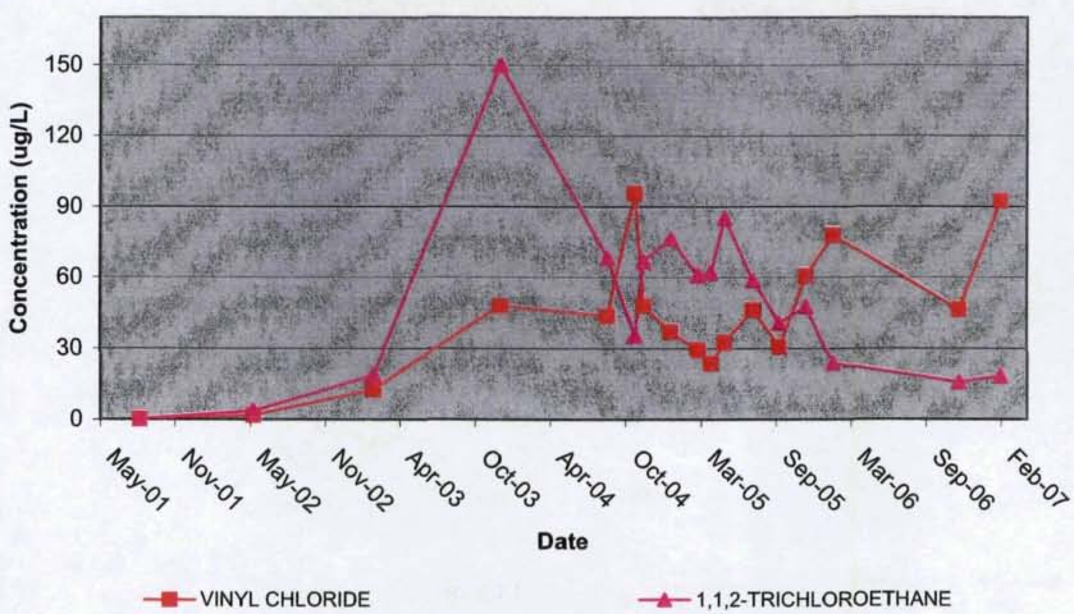
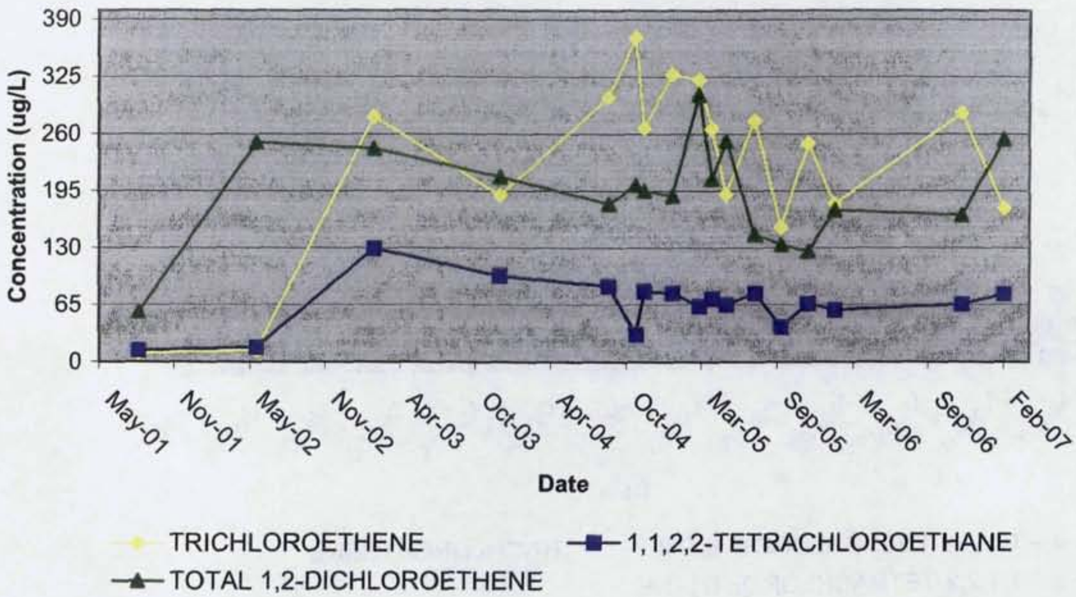


FIGURE B-35

CVOC DETECTED IN P07-10
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



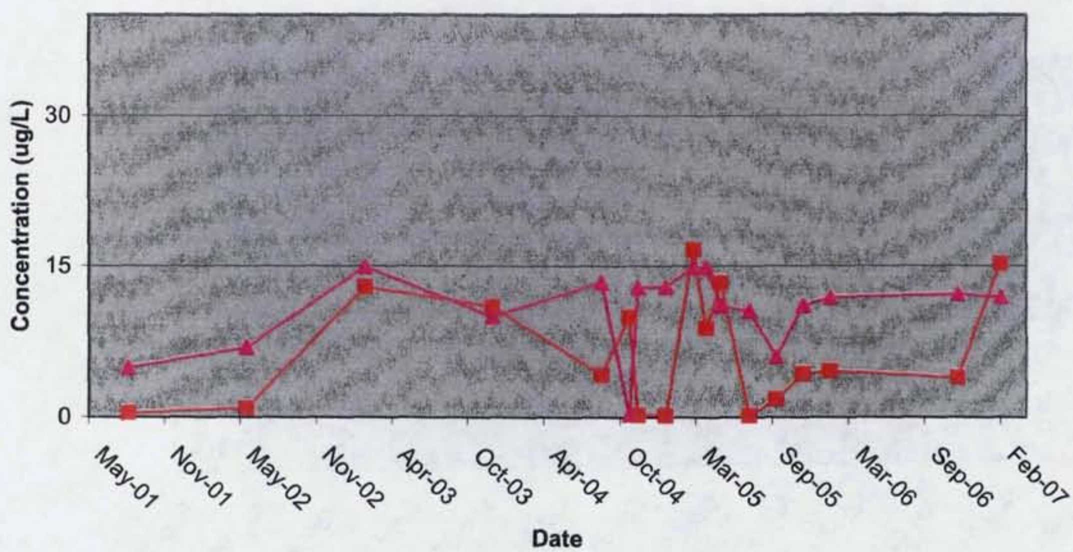


FIGURE B-36

CVOC DETECTED IN P07-13
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

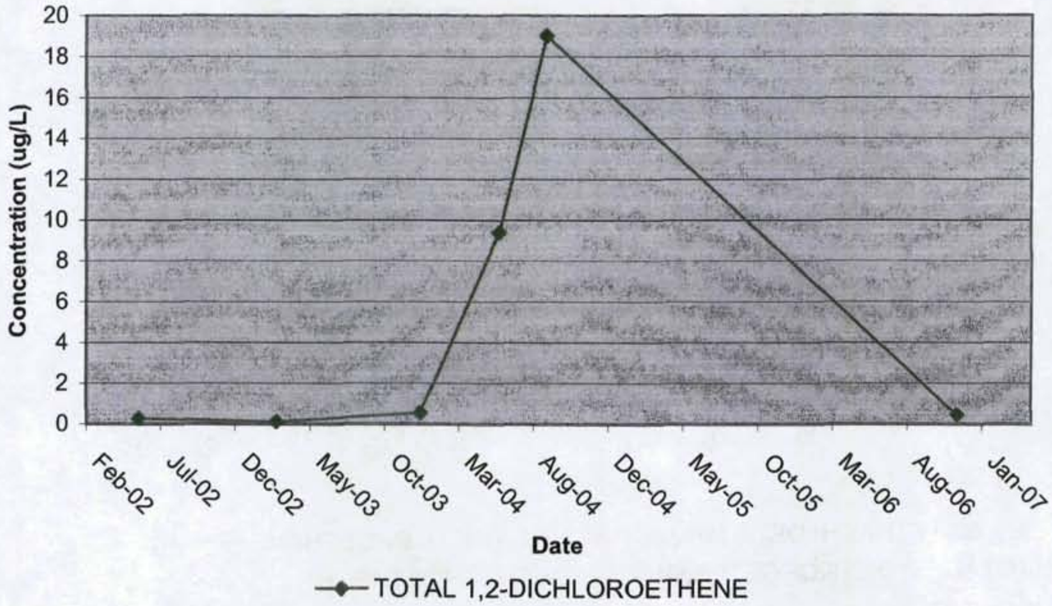


FIGURE B-37

CVOC DETECTED IN P07-15
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

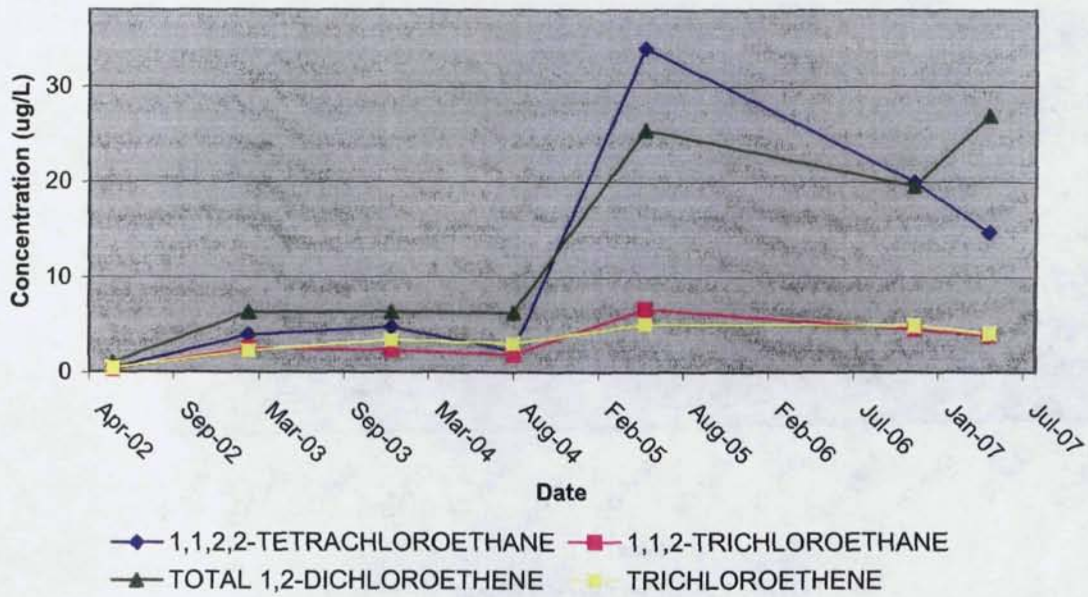


FIGURE B-38

CVOC DETECTED IN P07-16
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

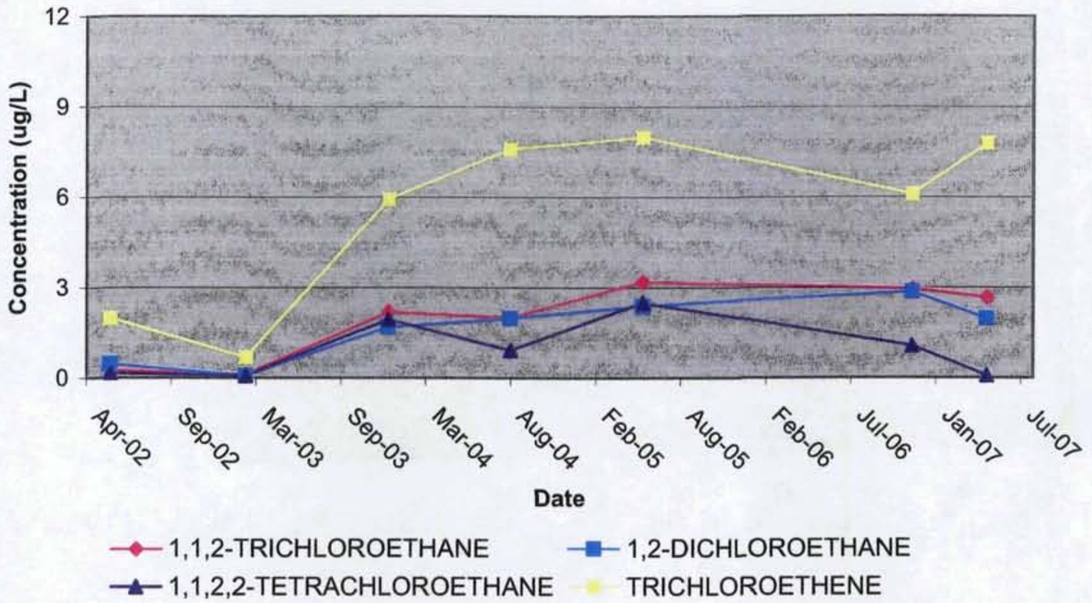
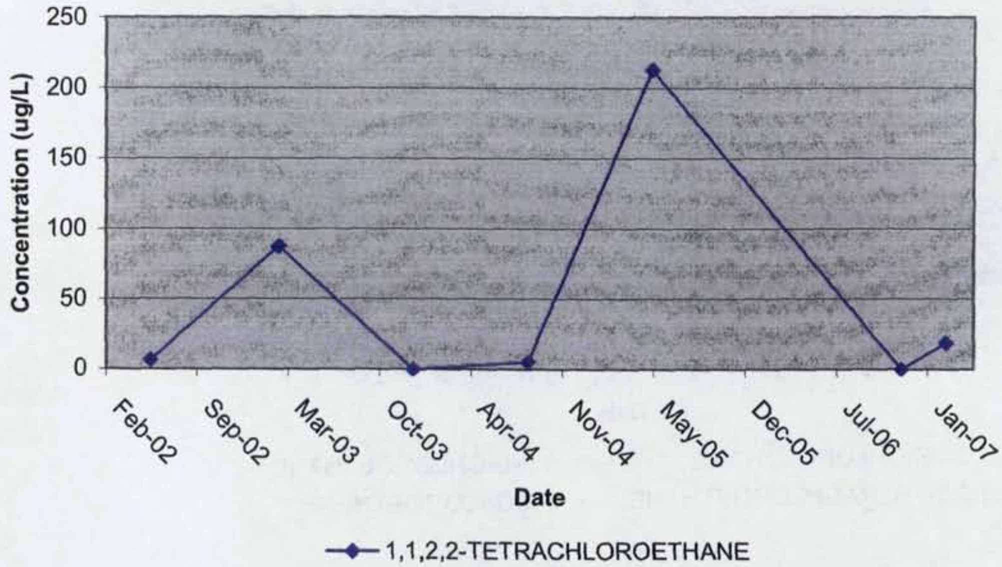


FIGURE B-39

CVOC DETECTED IN P07-20
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND
PAGE 1 OF 2



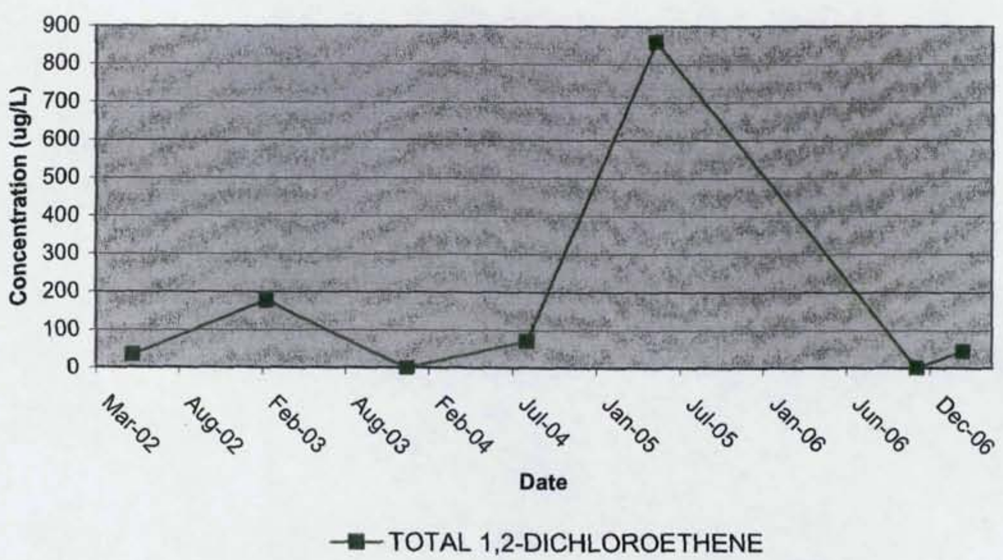


FIGURE B-39

CVOC DETECTED IN P07-20
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND
PAGE 2 OF 2

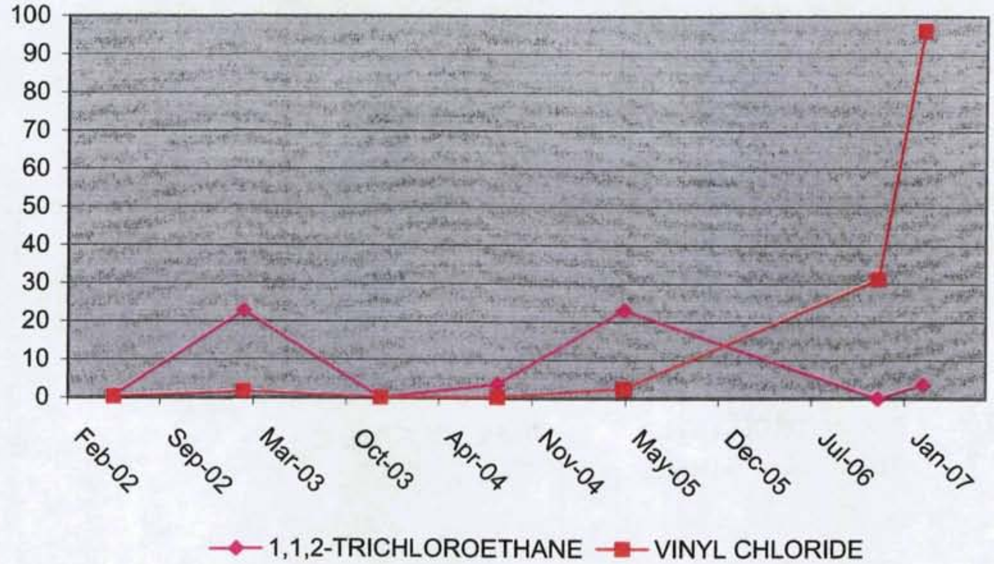
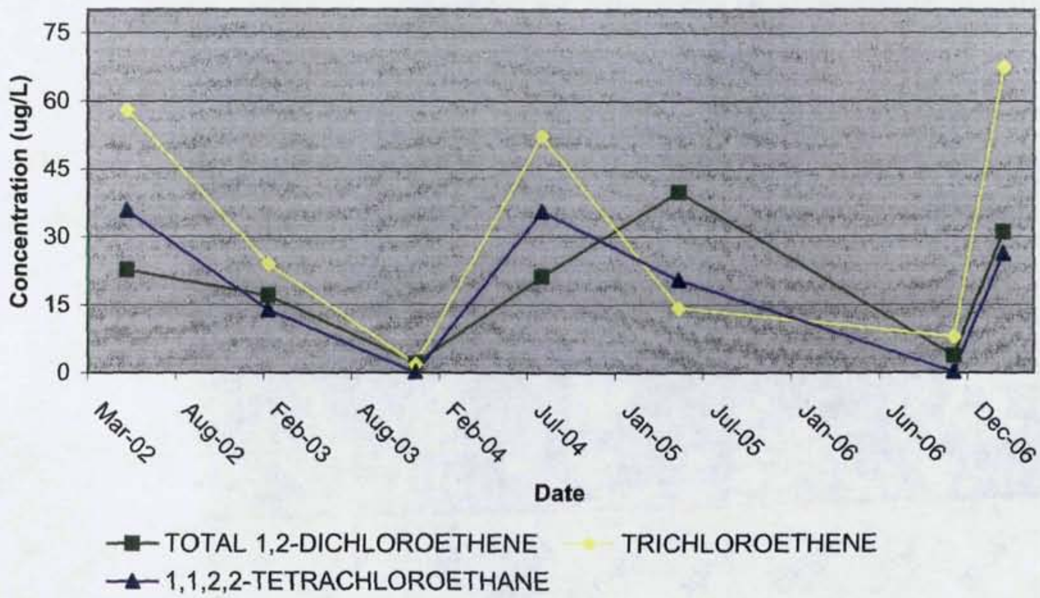


FIGURE B-40

CVOC DETECTED IN P07-21
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



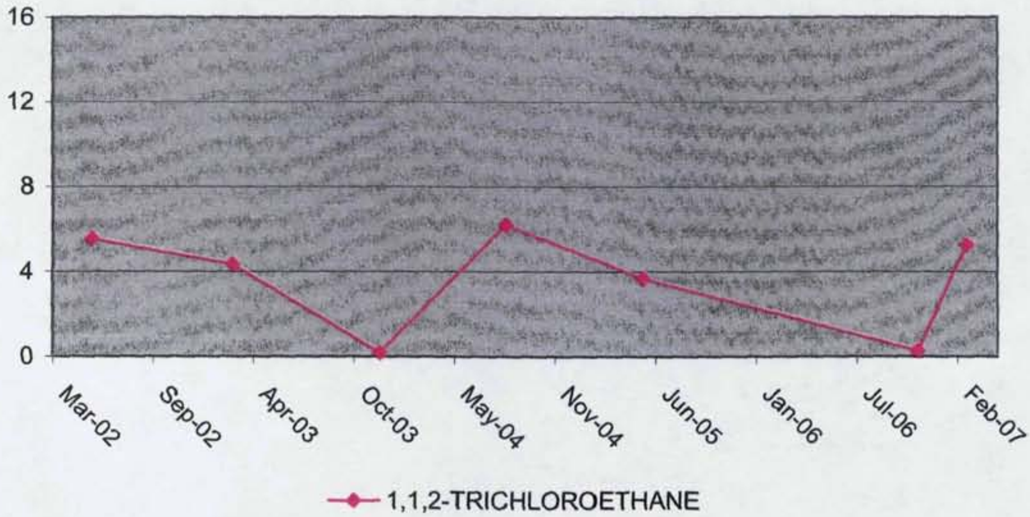
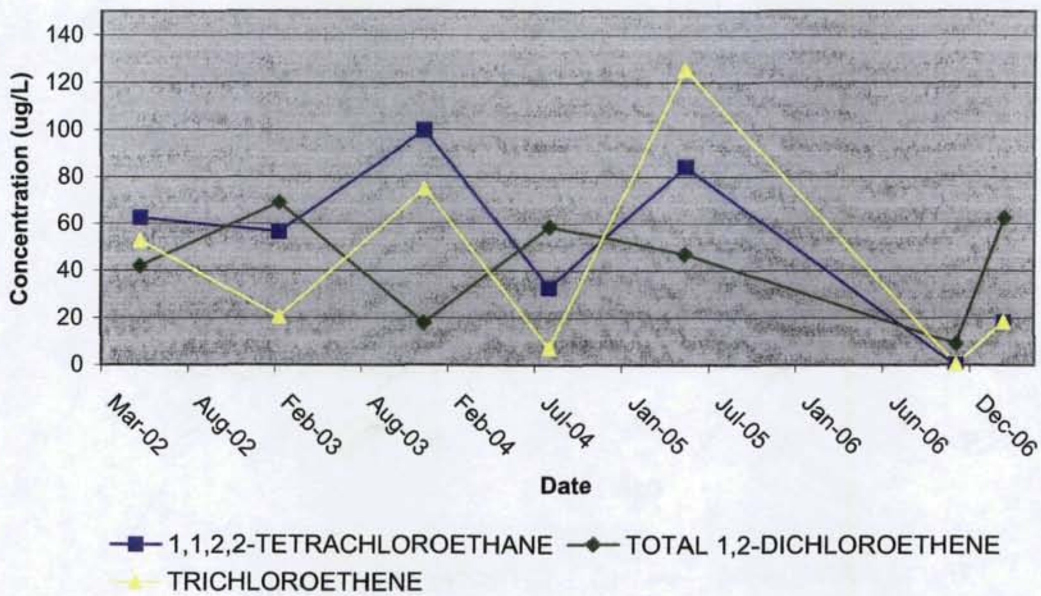


FIGURE B-41

CVOC DETECTED IN P07-22
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



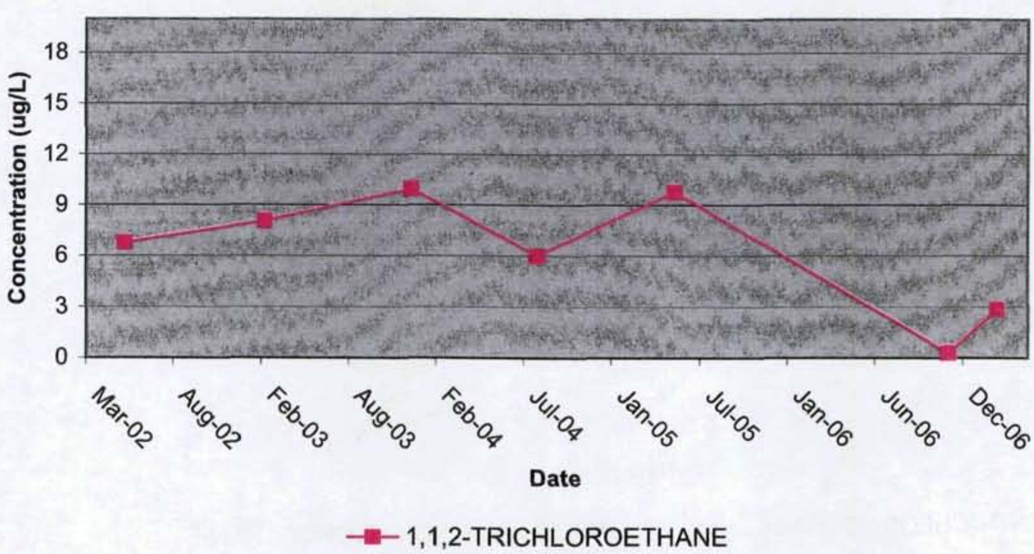
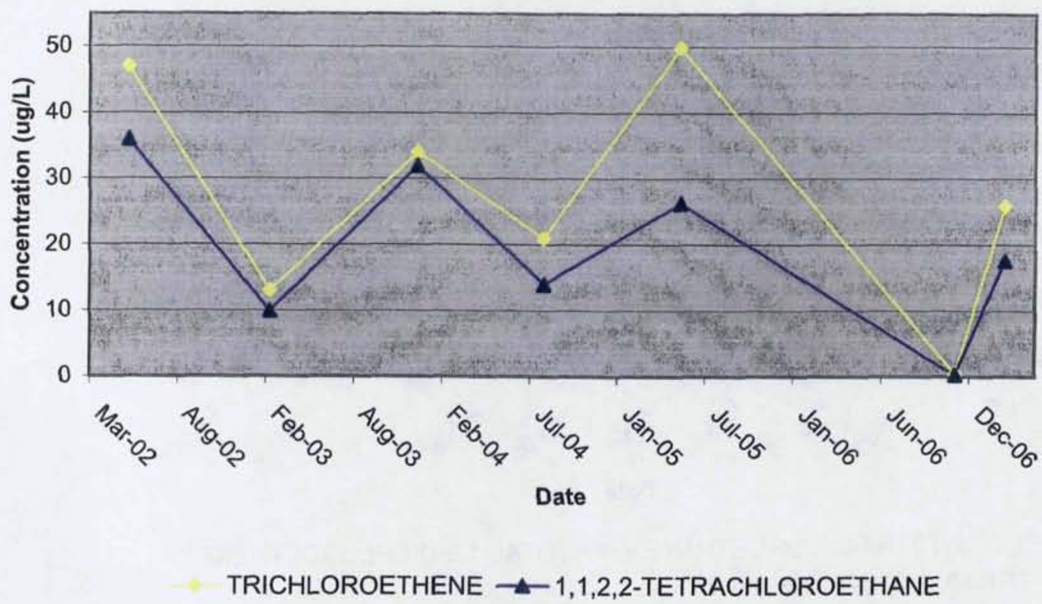


FIGURE B-42

CVOC DETECTED IN P07-23
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



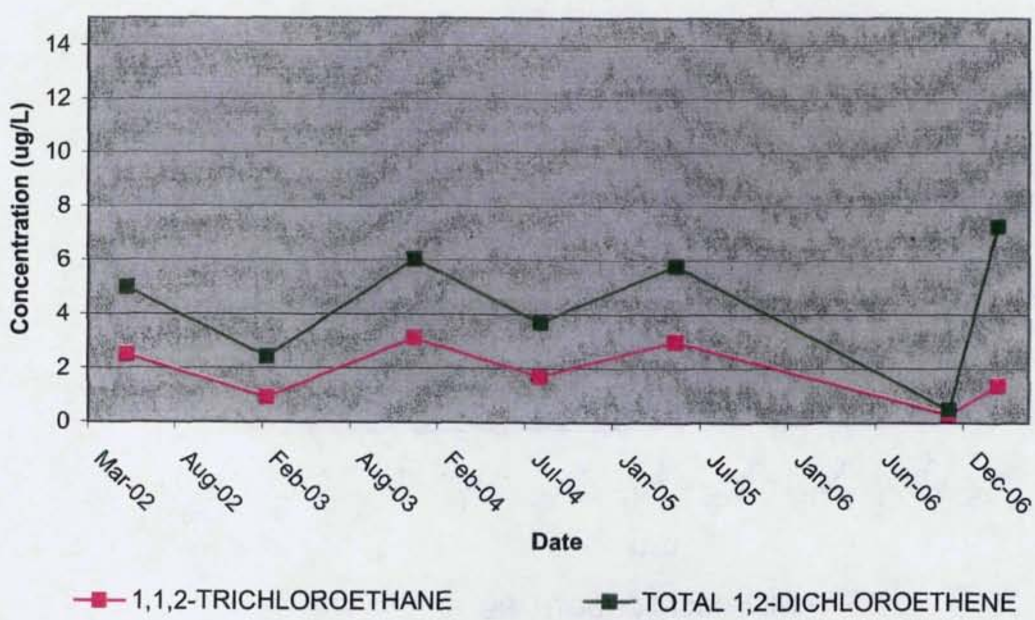
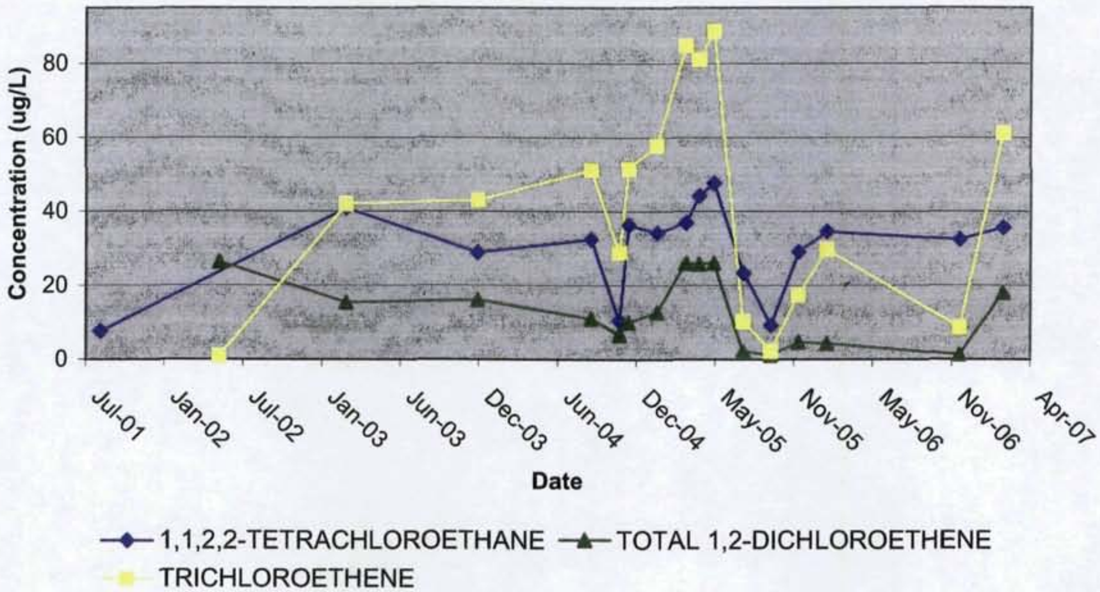
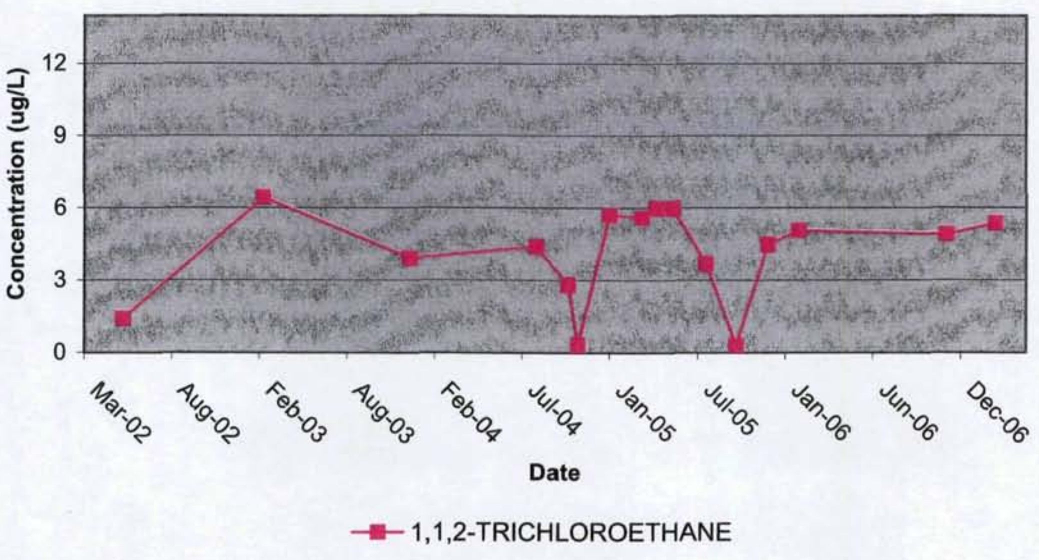


FIGURE B-43

CVOC DETECTED IN P07-24
SITE 07 - CALF PASTURE POINT
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND





APPENDIX C

SITE INSPECTION PHOTOGRAPHS

Photo No.: 1

Date: August 24, 2007

Comments: View of monitoring well triplet MW07-21 on the southern boundary of the Calf Pasture Point (CPP) site.

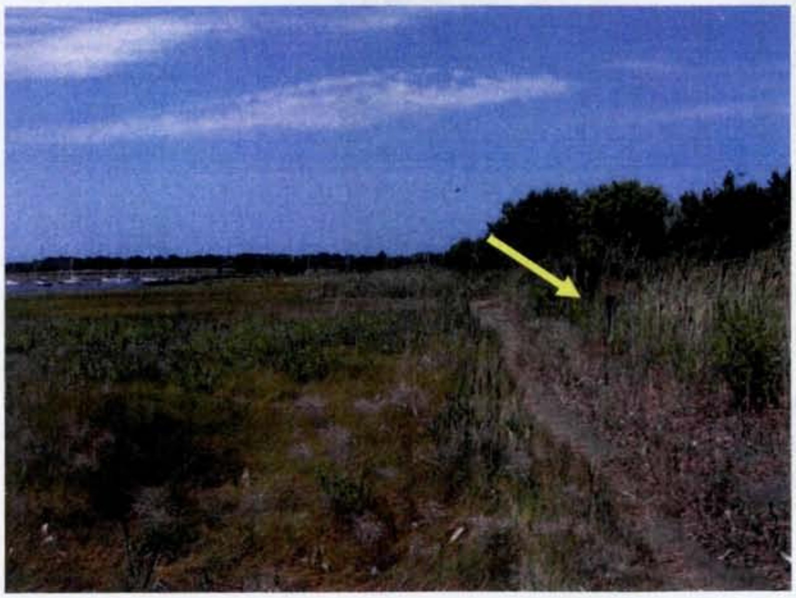


Photo No.: 2

Date: August 24, 2007

Comments: View of the southern boundary of the CPP site looking west. Monitoring well triplet MW07-24 is visible on the right.

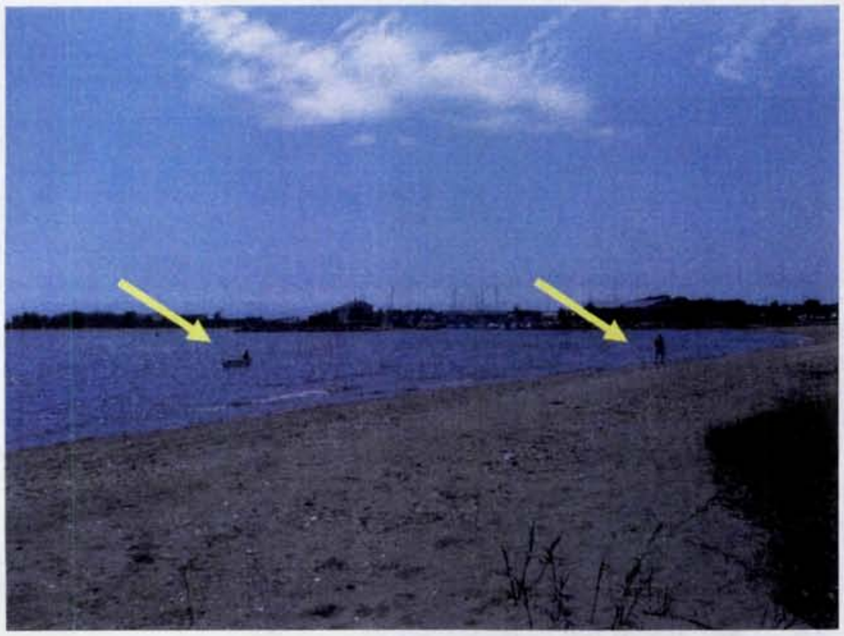


Photo No. 3

Date: August 24, 2007

Comments: View of the eastern boundary of the CPP site adjacent to Narragansett Bay. Note two individuals wading in the bay for shellfish.

Photo No: 4

Date: August 24, 2007

Comments: View of "Area Closed" sign posted along southern boundary of the CPP site.

Photo No. 5

Date: August 24, 2007

Comments: View of tipped over "No swimming or wading" sign along the southern boundary of the CPP site.

Photo No.: 6

Date: August 24, 2007

Comments: View of revetment and southern drainage channel along the southern boundary of the Allen Harbor Landfill (AHL). Note vegetation growing on the revetment slope.

Photo No.: 7

Date: August 24, 2007

Comments: View of monitoring well couplet MW09-24 located in southern portion of the AHL site. Note locked well casings.

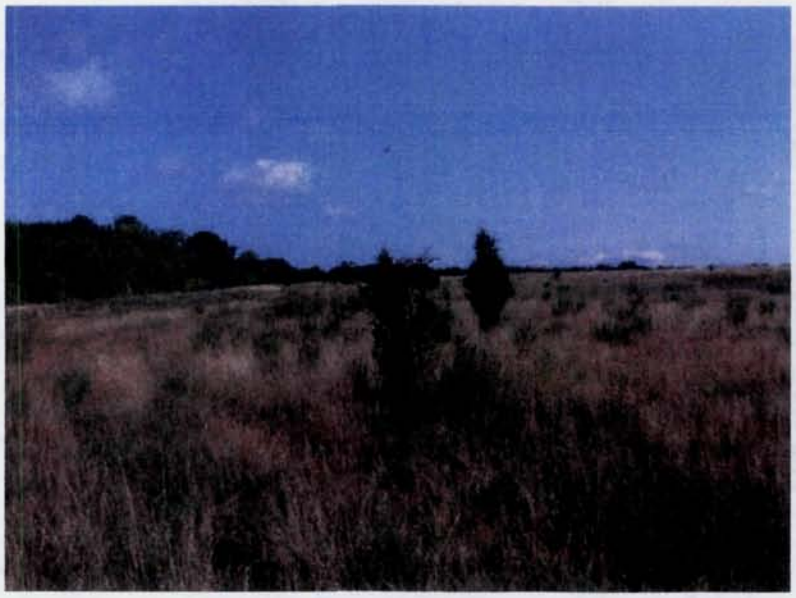


Photo No.: 8

Date: August 24, 2007

Comments: View of landfill cap vegetation at the AHL site looking north.

Photo No.: 9

Date: August 24, 2007

Comments: View of piezometers PZ09-09 located along the southern boundary of the AHL site. Note piezometers are not capped.

Photo No.: 10

Date: August 24, 2007

Comments: View of landfill gas vent GV09-01 located on southern portion of the AHL site.

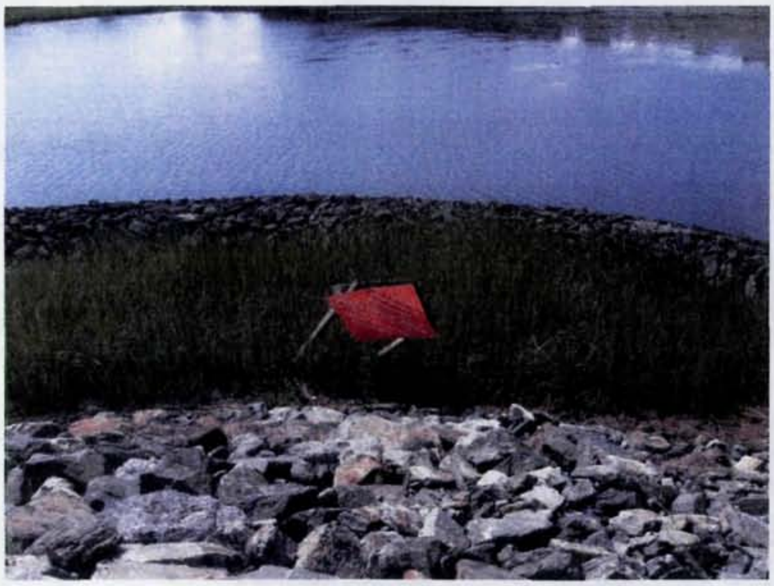


Photo No.: 11

Date: August 24, 2007

Comments: View of tipped over "Polluted Area" sign and constructed shoreline wetland along eastern boundary of the AHL site.

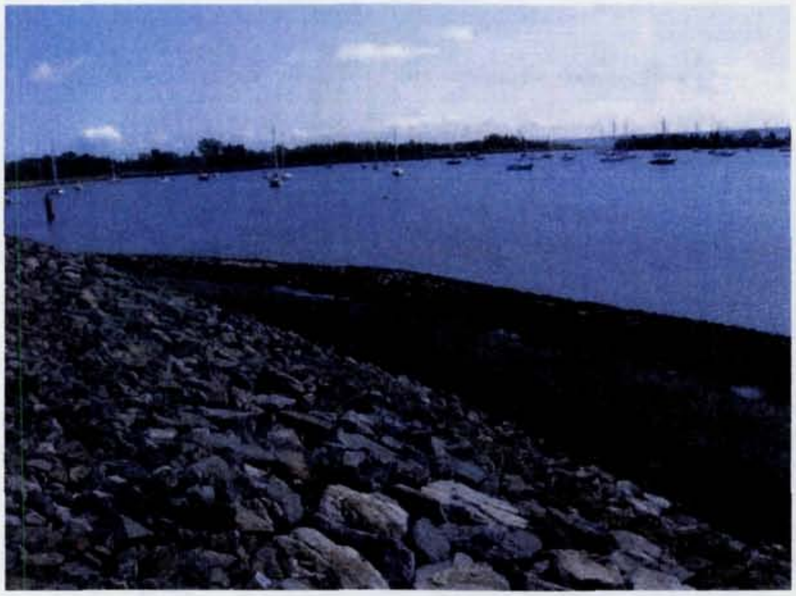


Photo No.: 12

Date: August 24, 2007

Comments: View of area of constructed wetland that is bare of wetland vegetation along eastern boundary of AHL site.

Photo No.: 13

Date: August 24, 2007

Comments: View of vehicle ruts on the landfill cover of the AHL site.

Photo No.: 14

Date: August 24, 2007

Comments: View of debris and vegetation growing in the northern drainage swale of the AHL site.

Photo No.: 15

Date: August 24, 2007

Comments: View of "Polluted Area" sign along northeast boundary of the AHL site.

Photo No.: 16

Date: August 24, 2007

Comments: View of rules and regulations sign along western perimeter of the AHL site.

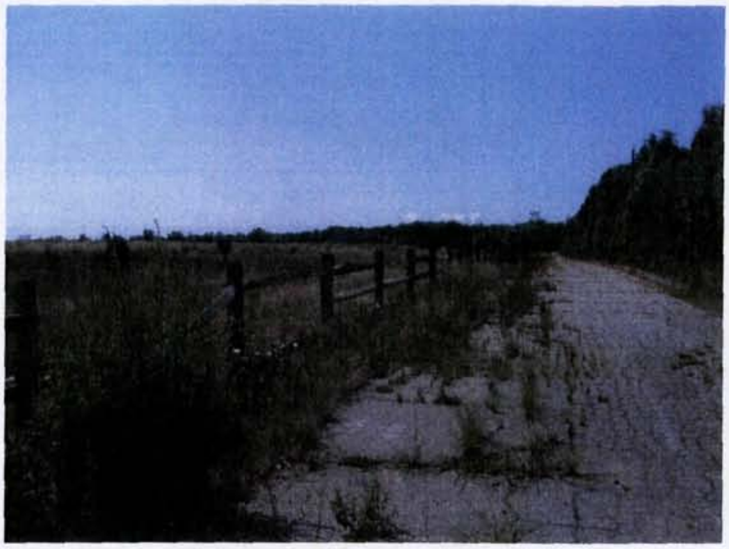


Photo No.: 17

Date: August 24, 2007

Comments: View of access road and perimeter fence along the western boundary of the AHL site.

APPENDIX D

ALLEN HARBOR LANDFILL CONCENTRATION TREND GRAPHS

FIGURE D-1

TCE DETECTED IN MW09-03D
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

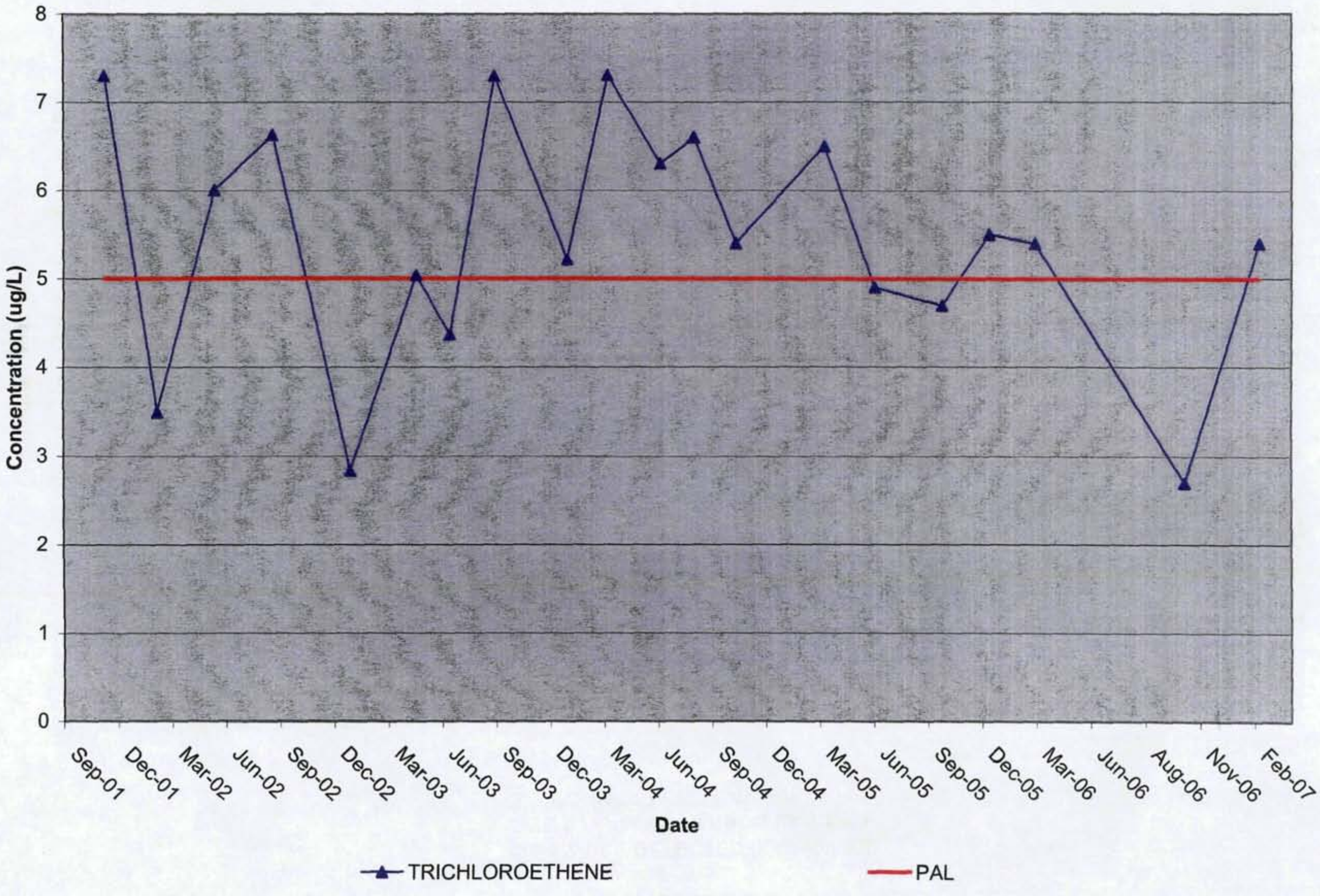


FIGURE D-2

CIS-1,2-DCE DETECTED IN MW09-03D
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

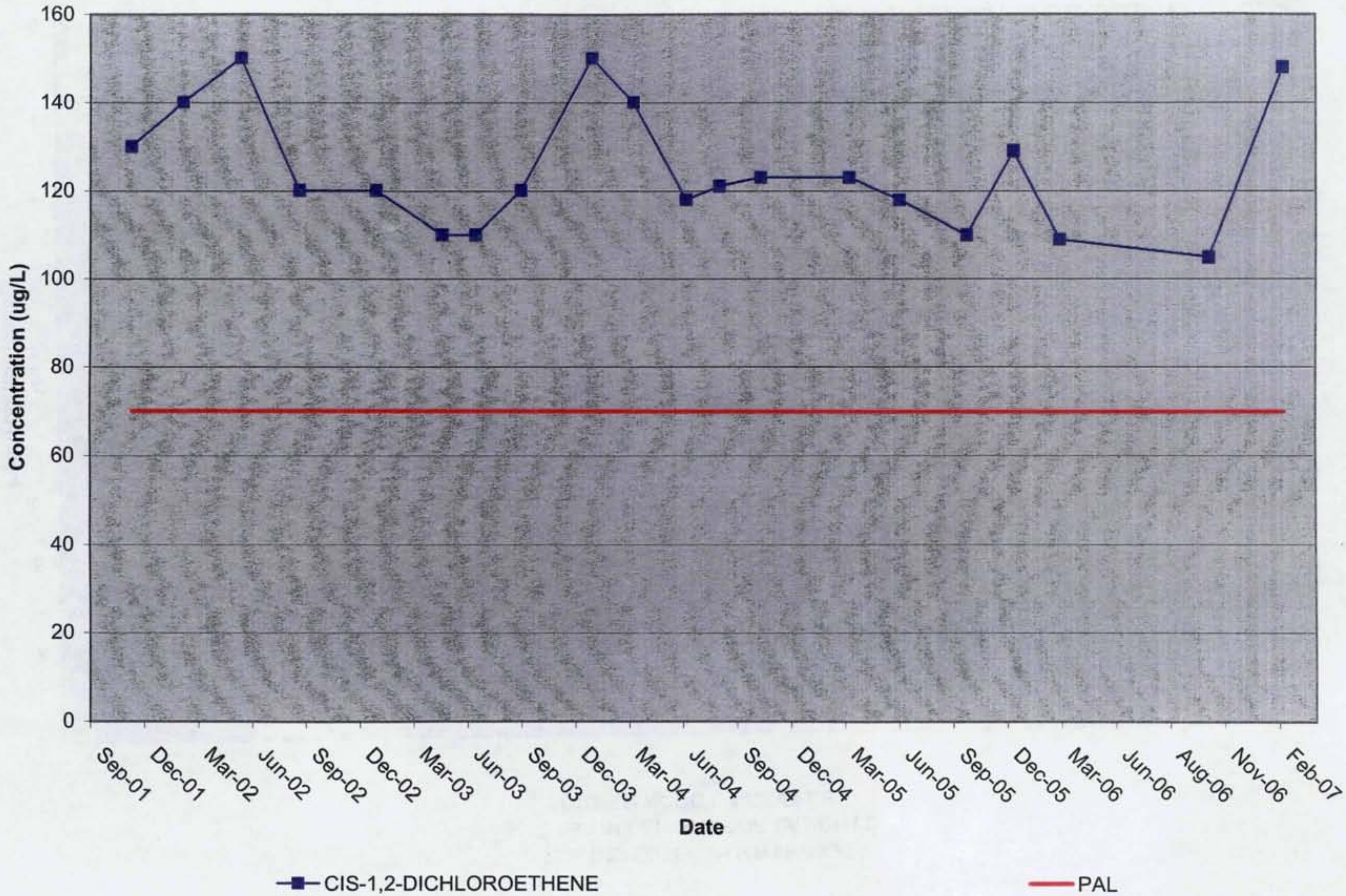


FIGURE D-3

VINYL CHLORIDE DETECTED IN MW09-03D
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

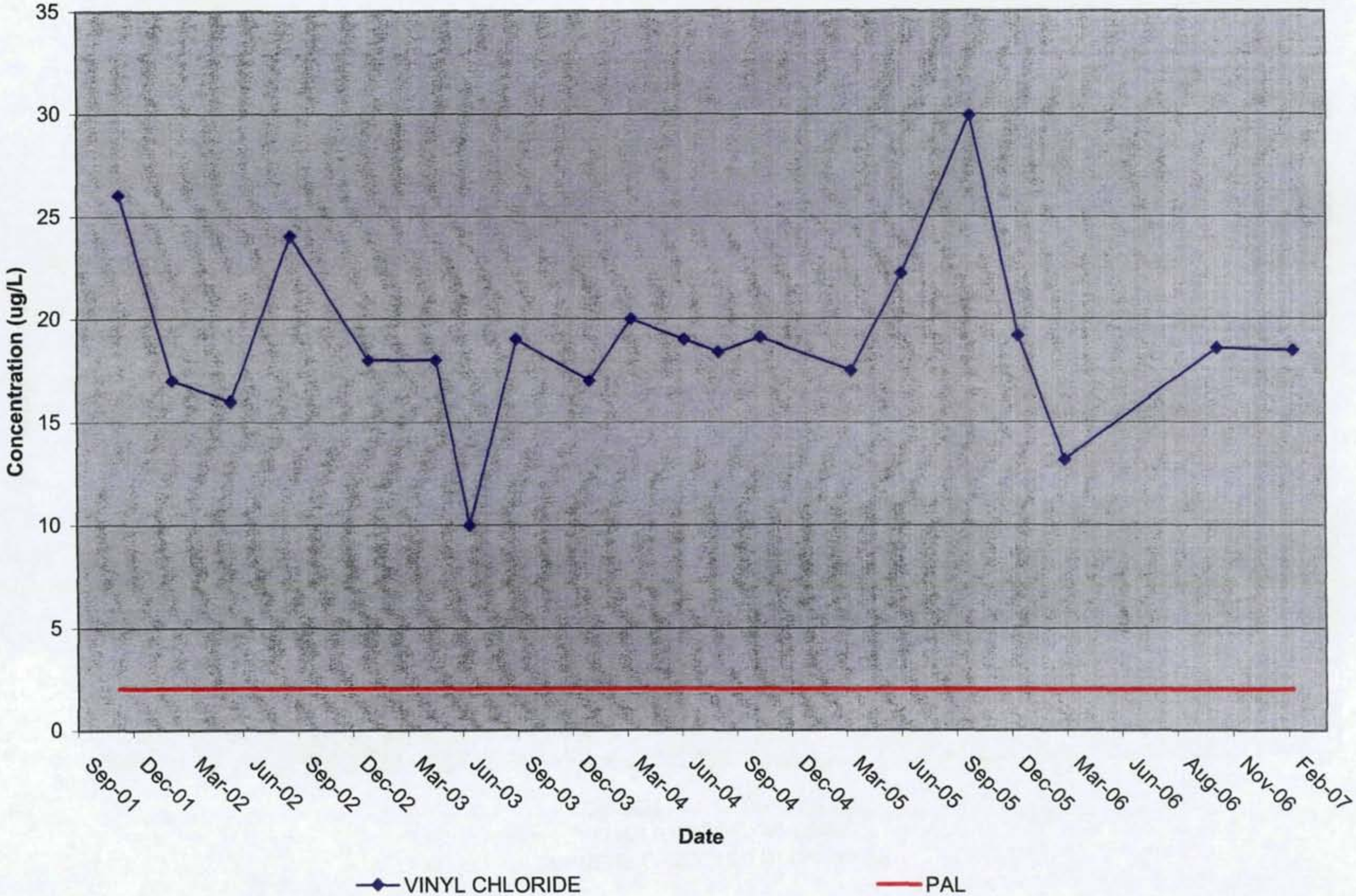


FIGURE D-4

BENZENE DETECTED IN MW09-07S
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

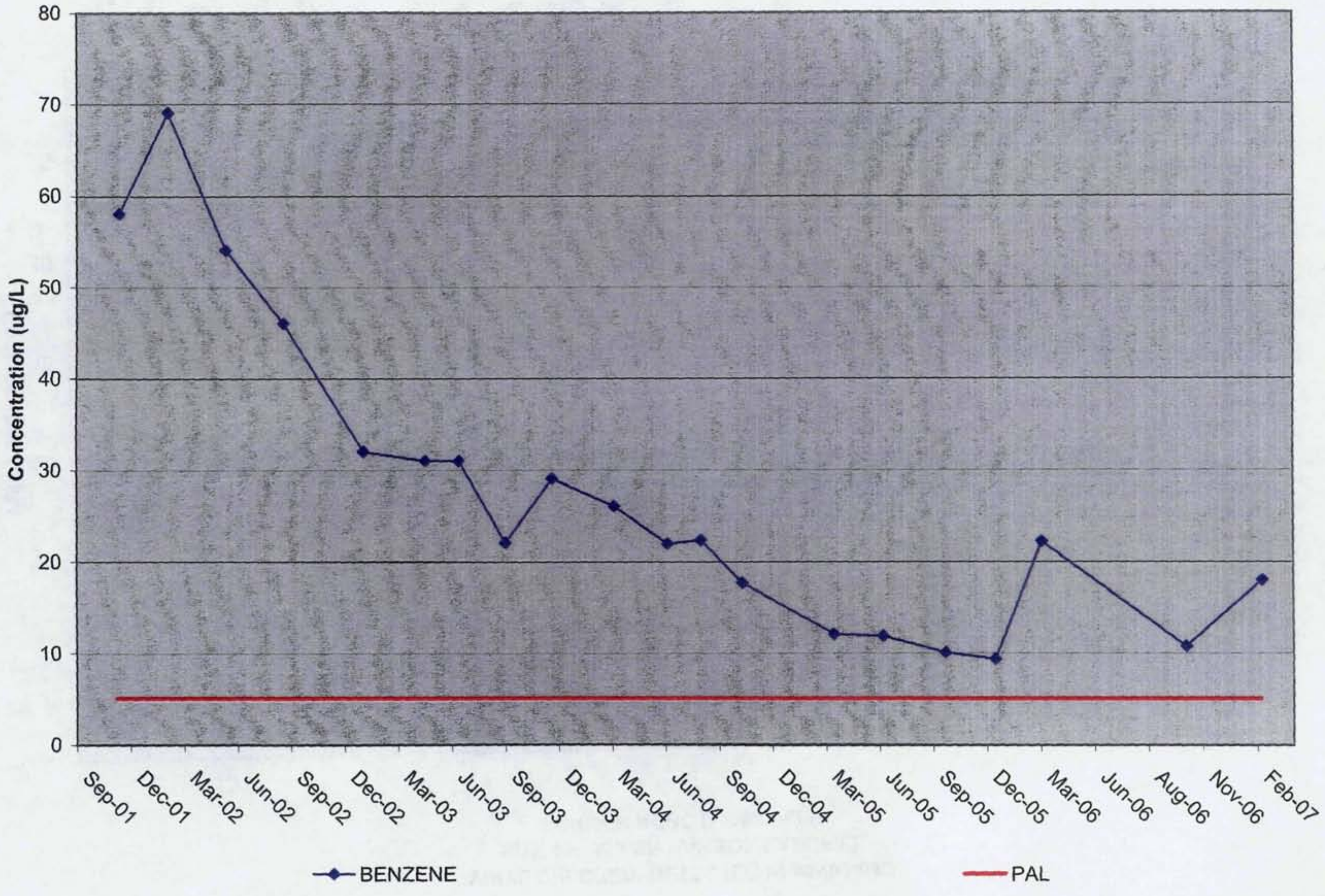


FIGURE D-5

NAPHTHALENE DETECTED IN MW09-07S
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

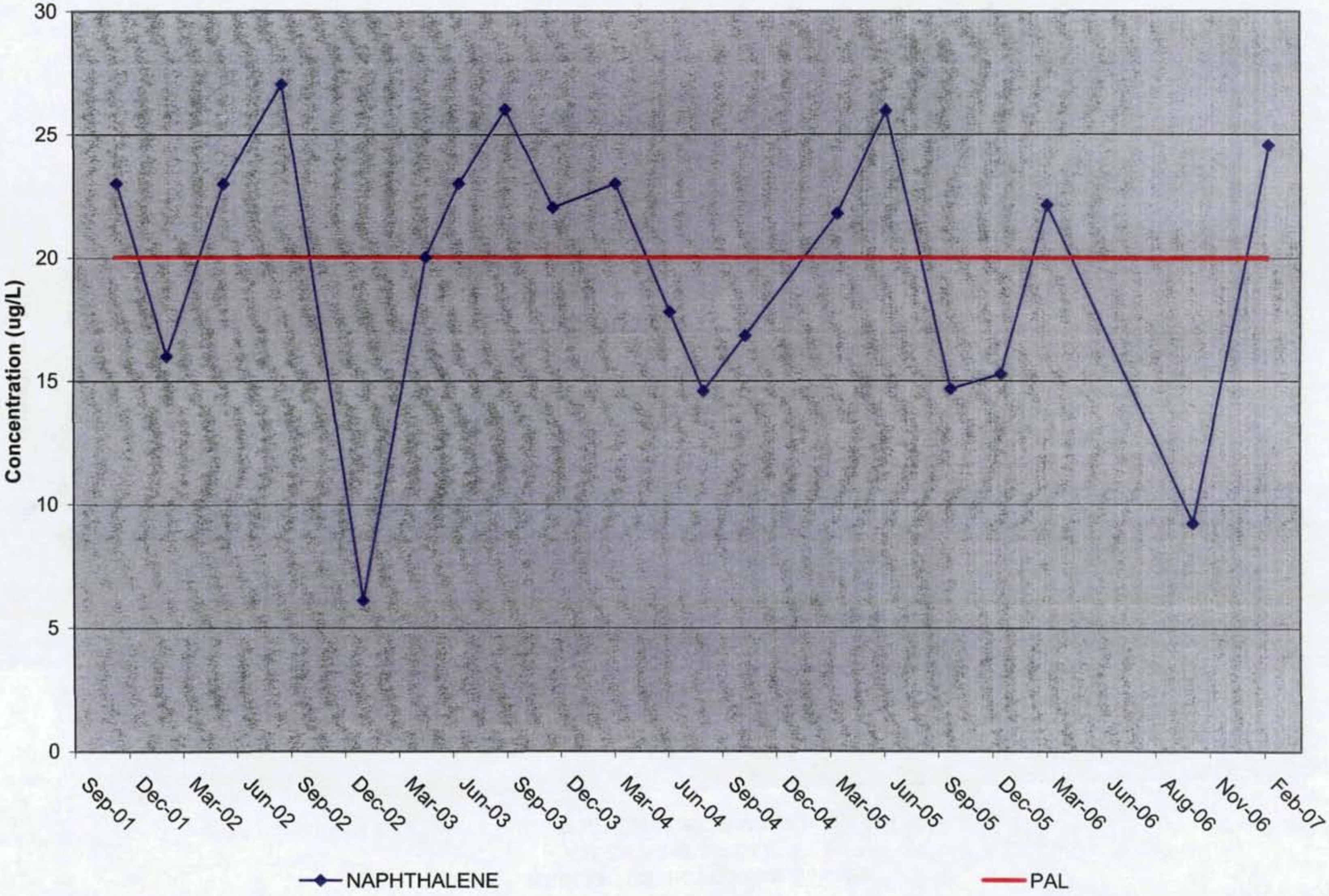


FIGURE D-6

ARSENIC DETECTED IN MW09-07S
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

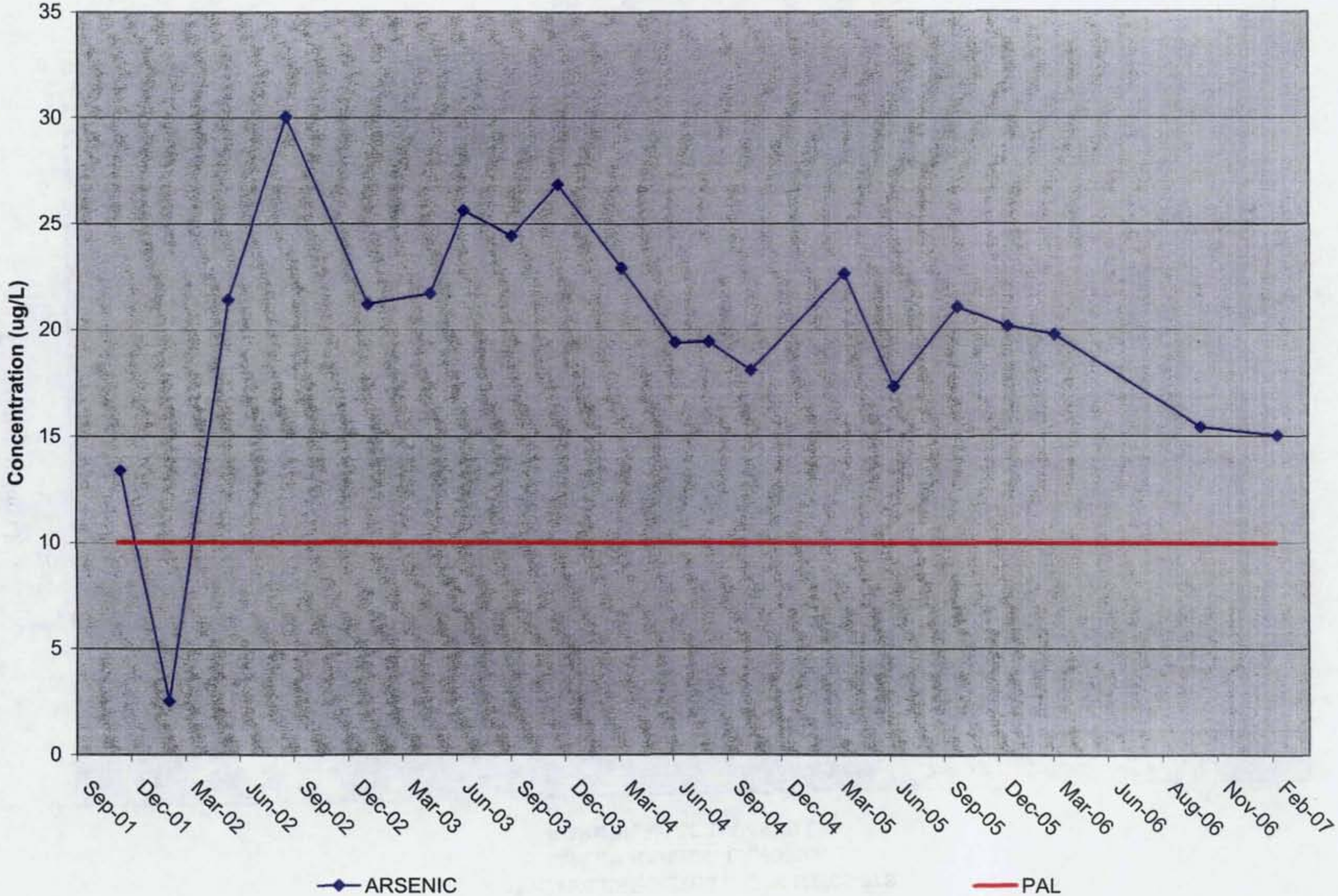


FIGURE D-7

VINYL CHLORIDE DETECTED IN MW09-08S
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

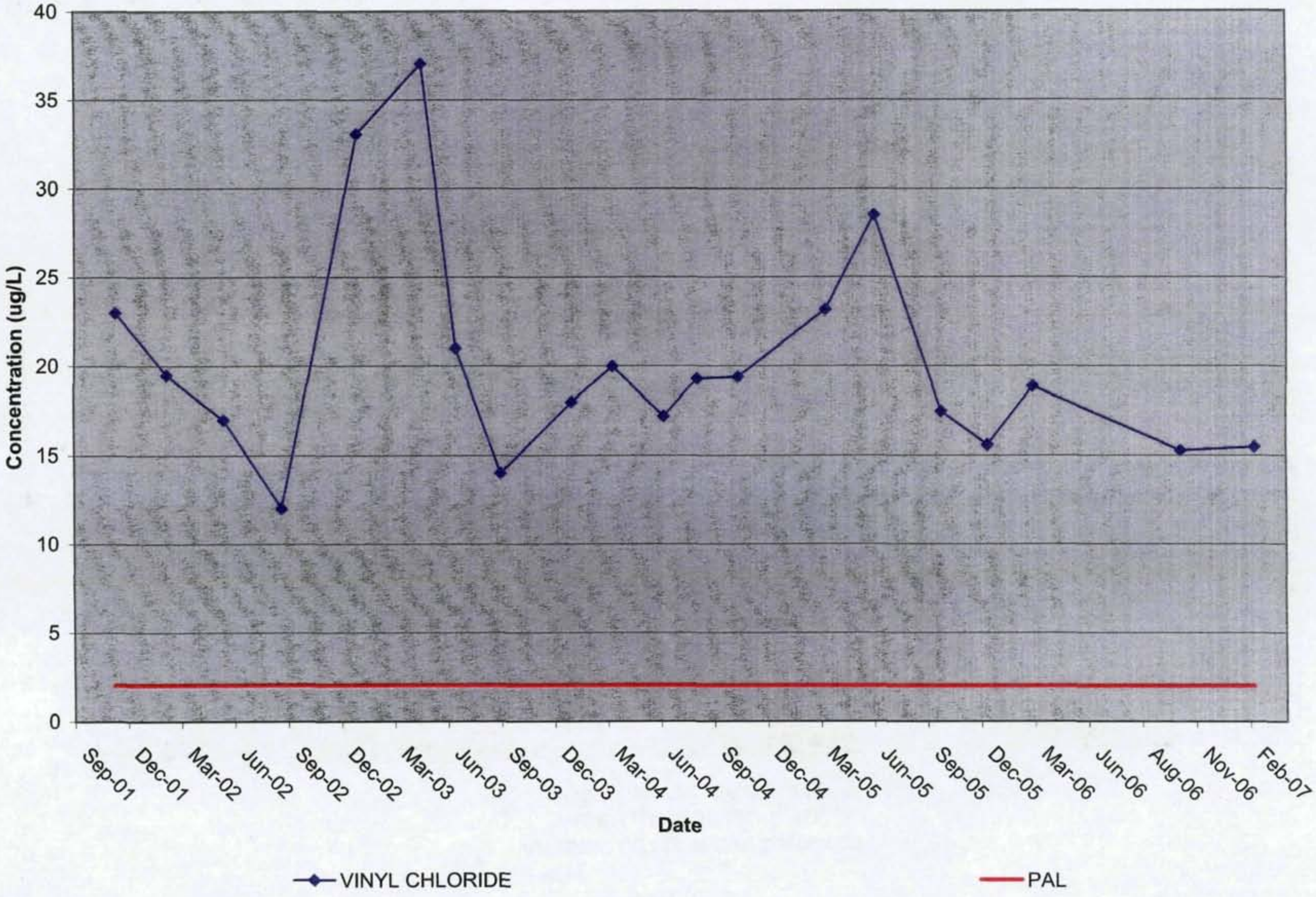


FIGURE D-8

ARSENIC DETECTED IN MW09-08S
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

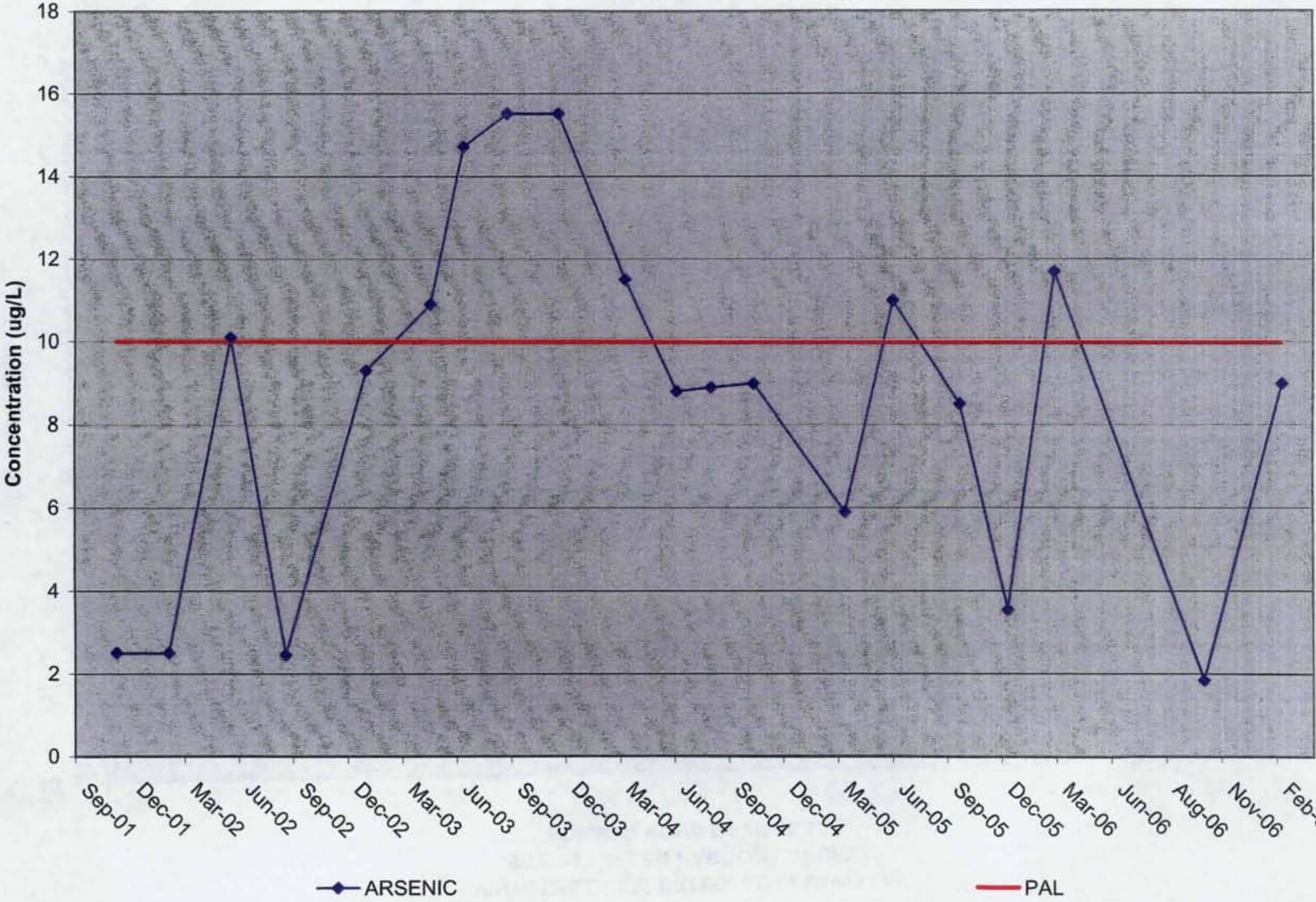


FIGURE D-9

CIS-1,2-DCE DETECTED IN MW09-09S
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

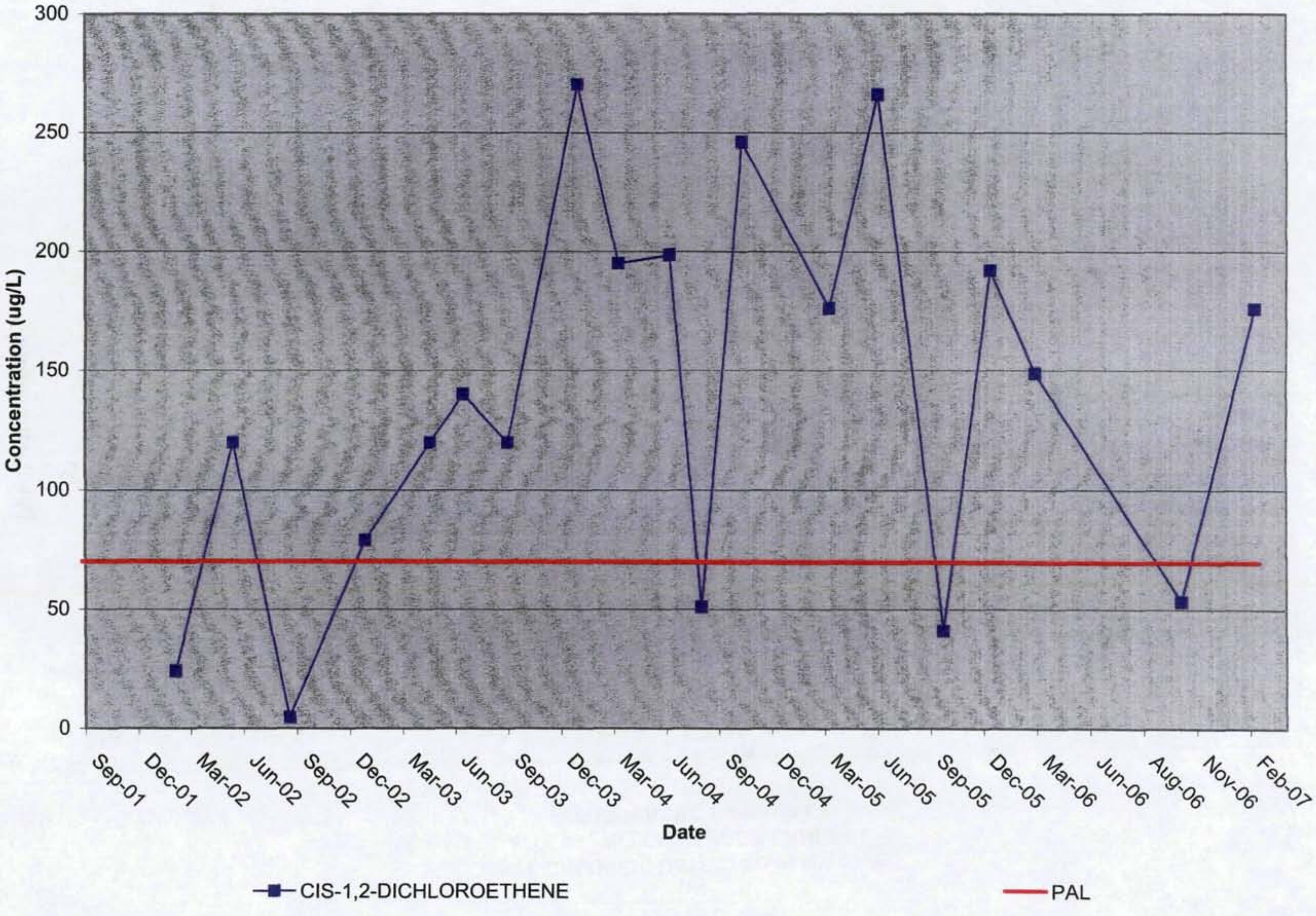


FIGURE D-10

VINYL CHLORIDE DETECTED IN MW09-09S
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

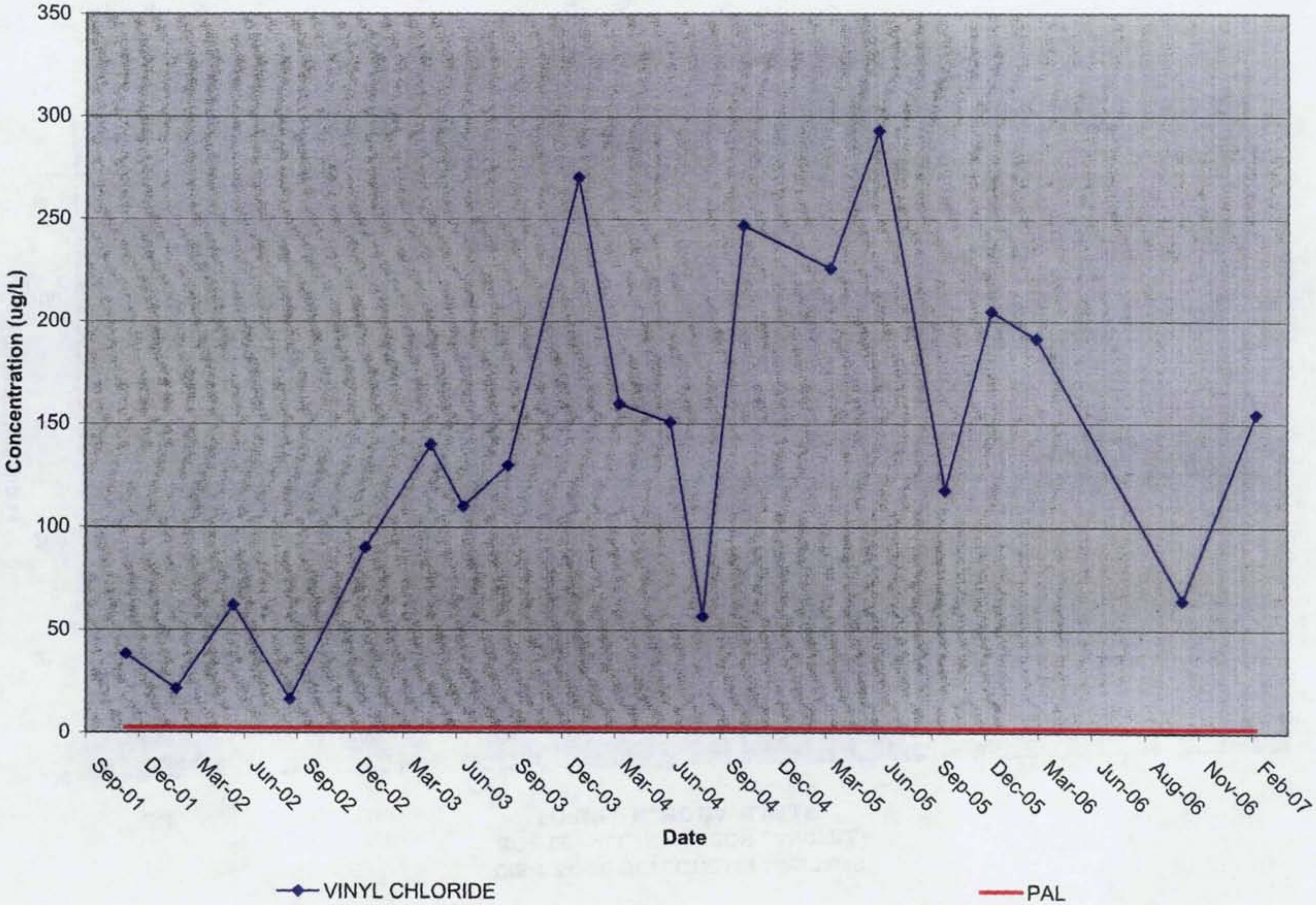


FIGURE D-11

BENZENE DETECTED IN MW09-09S
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

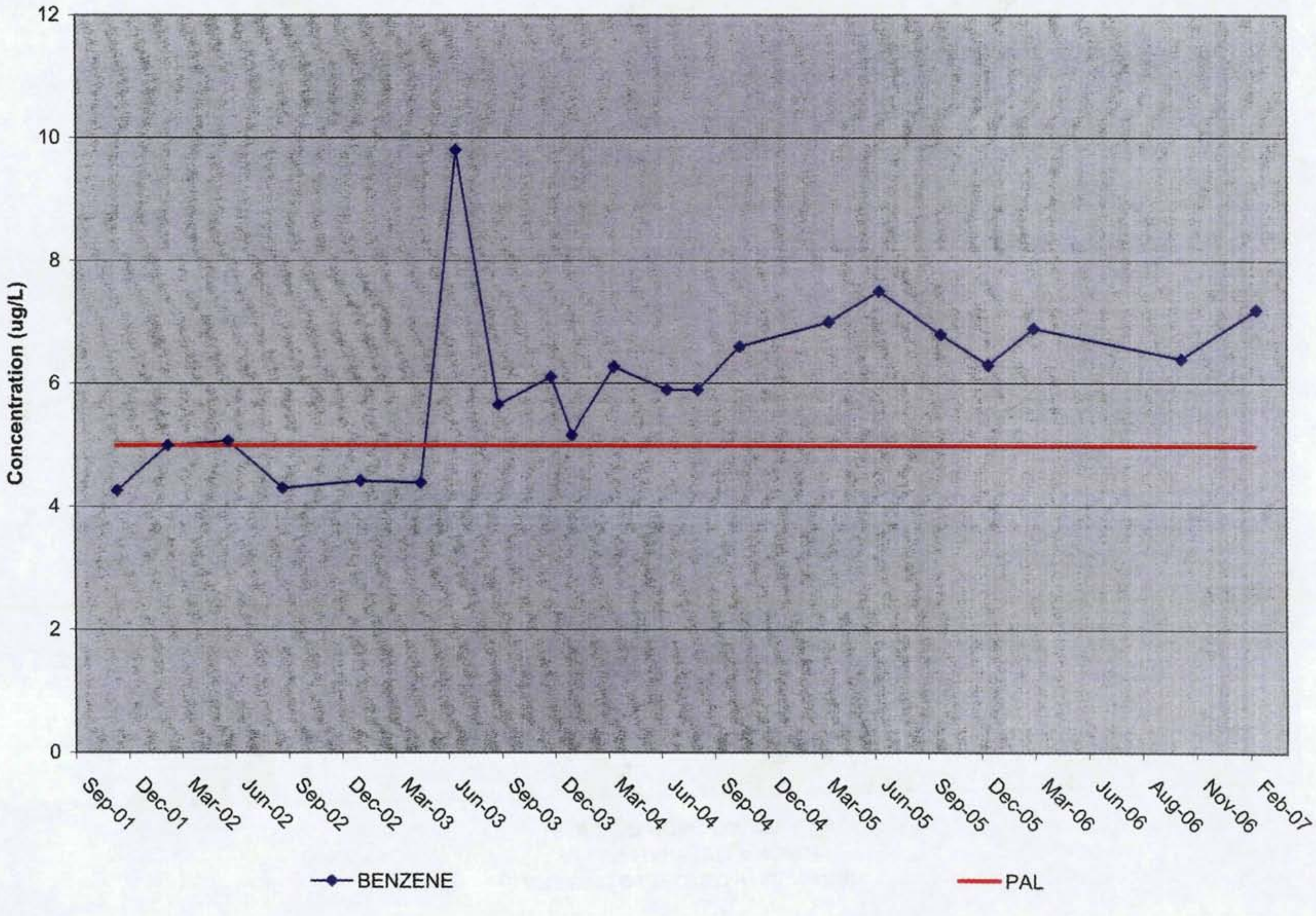


FIGURE D-12

ARSENIC DETECTED IN MW09-10S
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

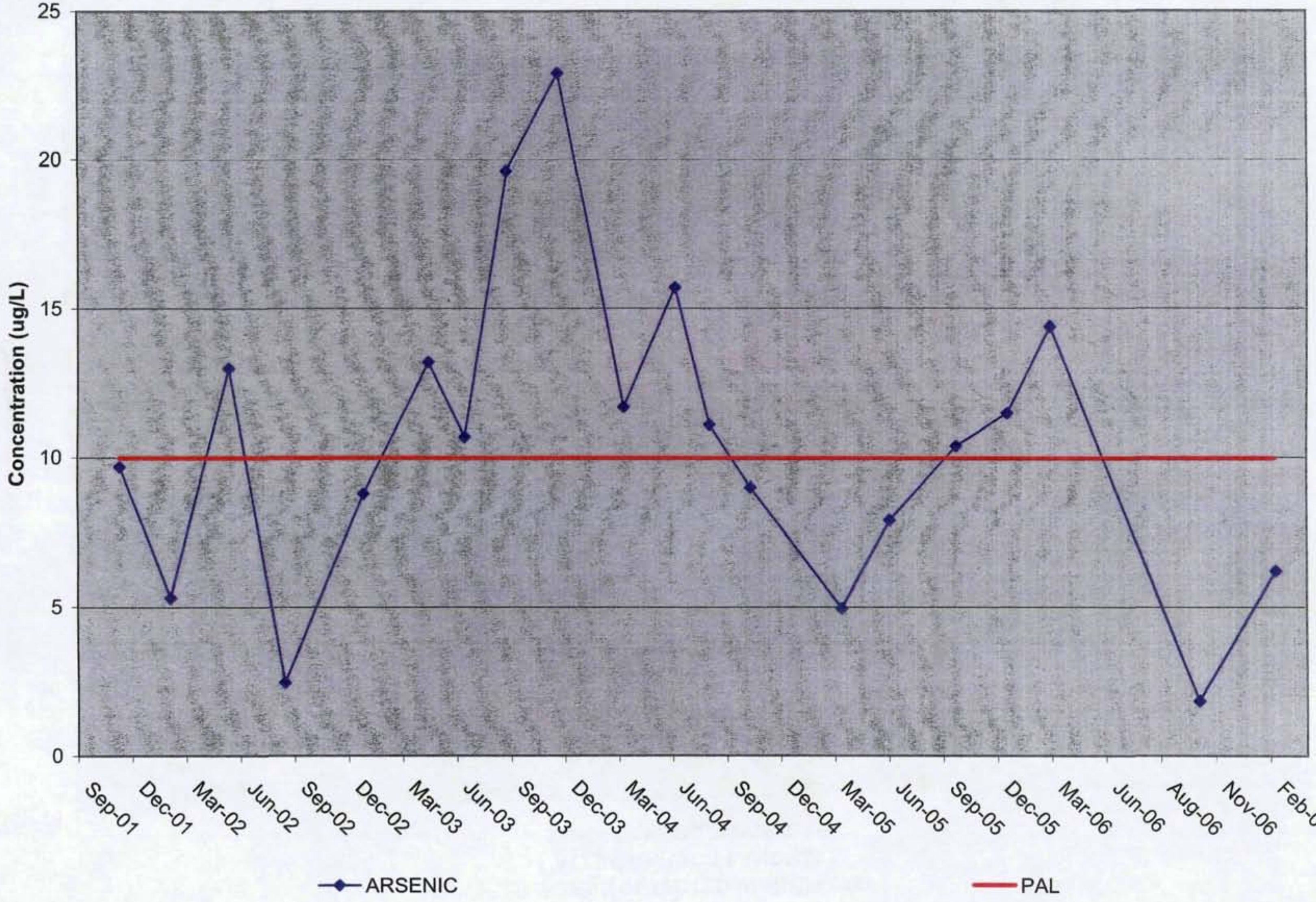


FIGURE D-13

TCE DETECTED IN MW09-20I
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

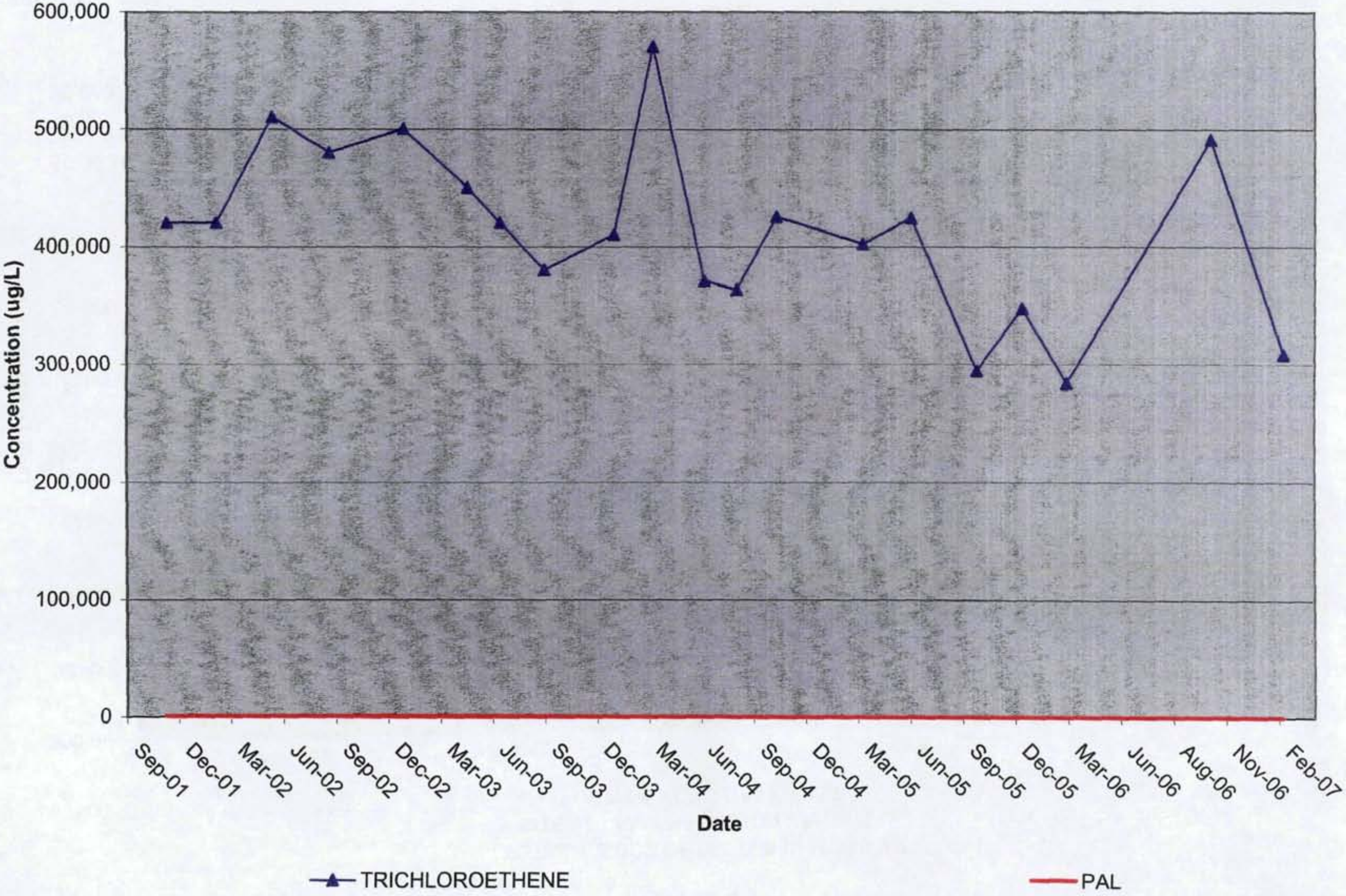


FIGURE D-14

TOTAL 1,2-DCE DETECTED IN MW09-20I
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

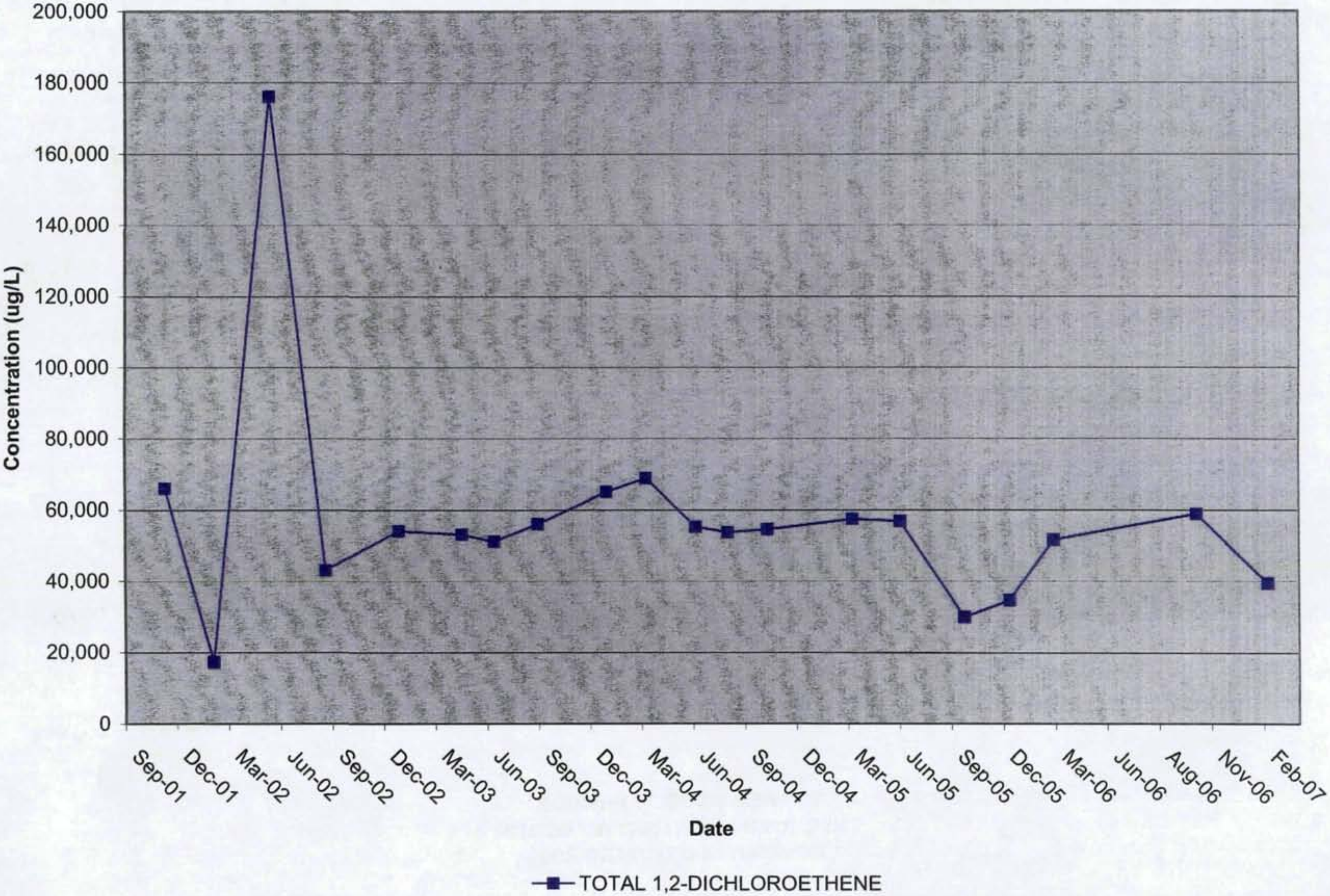


FIGURE D-15

VINYL CHLORIDE DETECTED IN MW09-20I
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

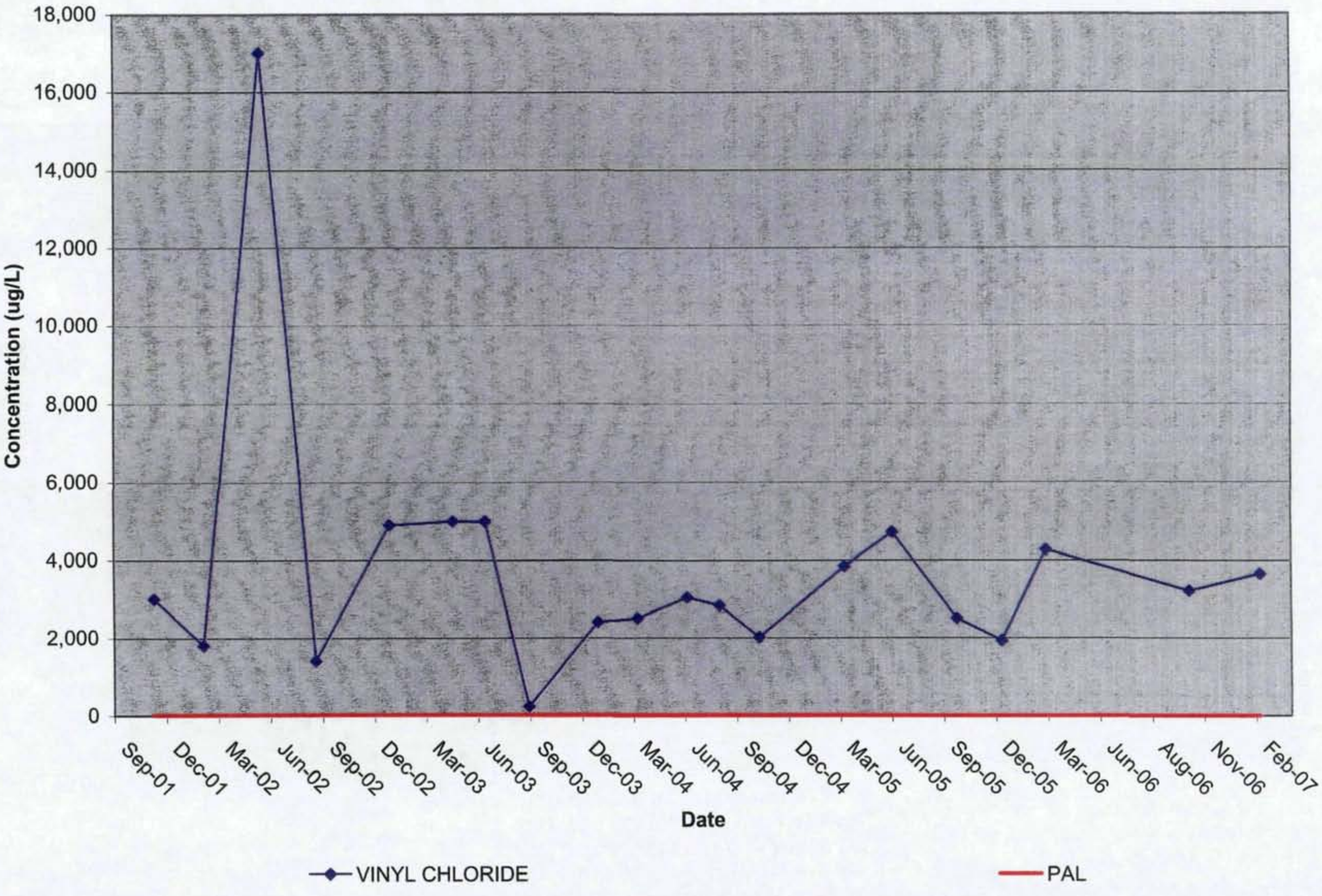


FIGURE D-16

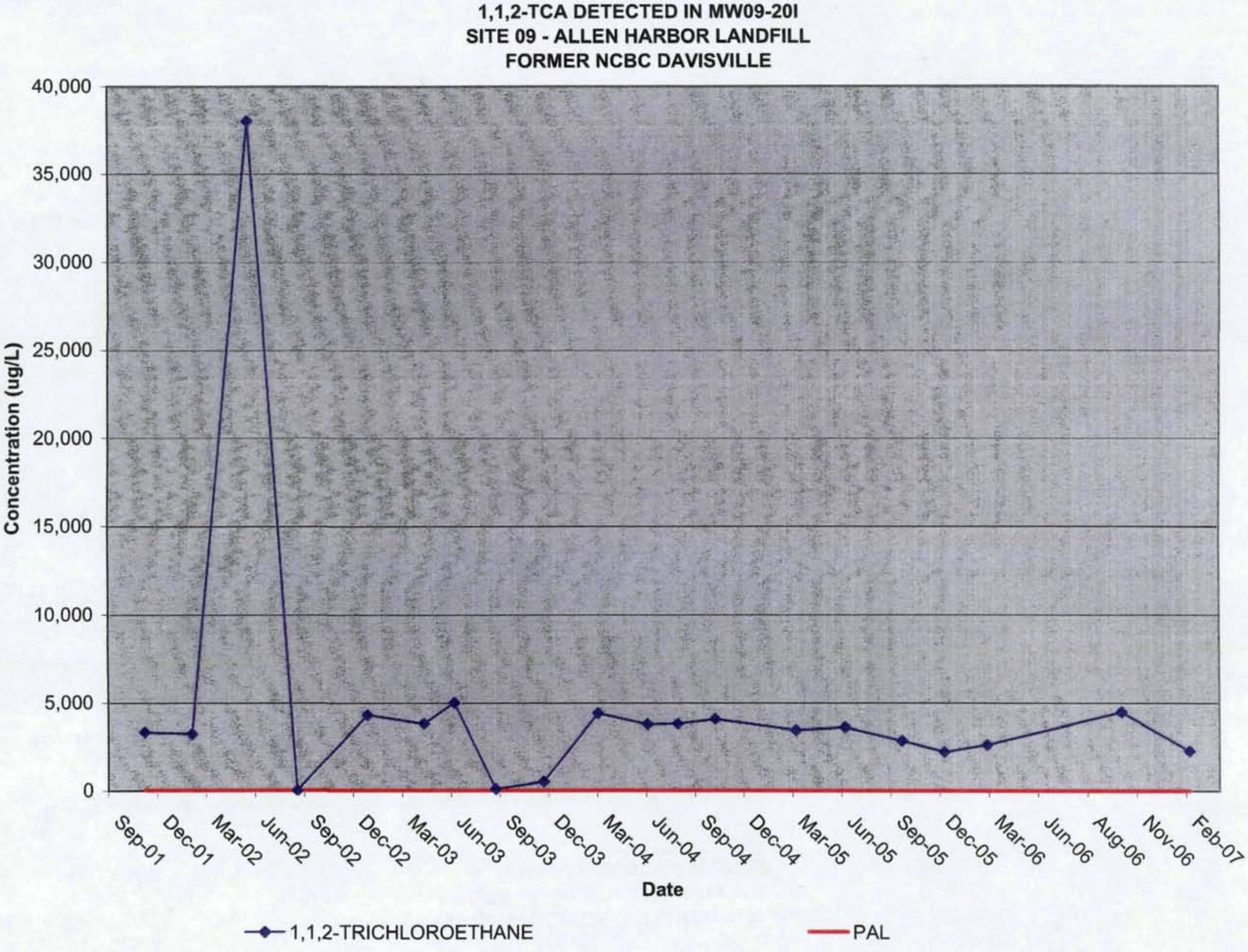

1,1,2-TCA DETECTED IN MW09-20I
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
Concentration (ug/L)
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
Sep-01
Dec-01
Mar-02
Jun-02
Sep-02
Dec-02
Mar-03
Jun-03
Sep-03
Dec-03
Mar-04
Jun-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
Dec-05
Mar-06
Jun-06
Aug-06
Nov-06
Feb-07
Date
1,1,2-TRICHLOROETHANE
PAL

FIGURE D-17

1,1-DCE DETECTED IN MW09-20I
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

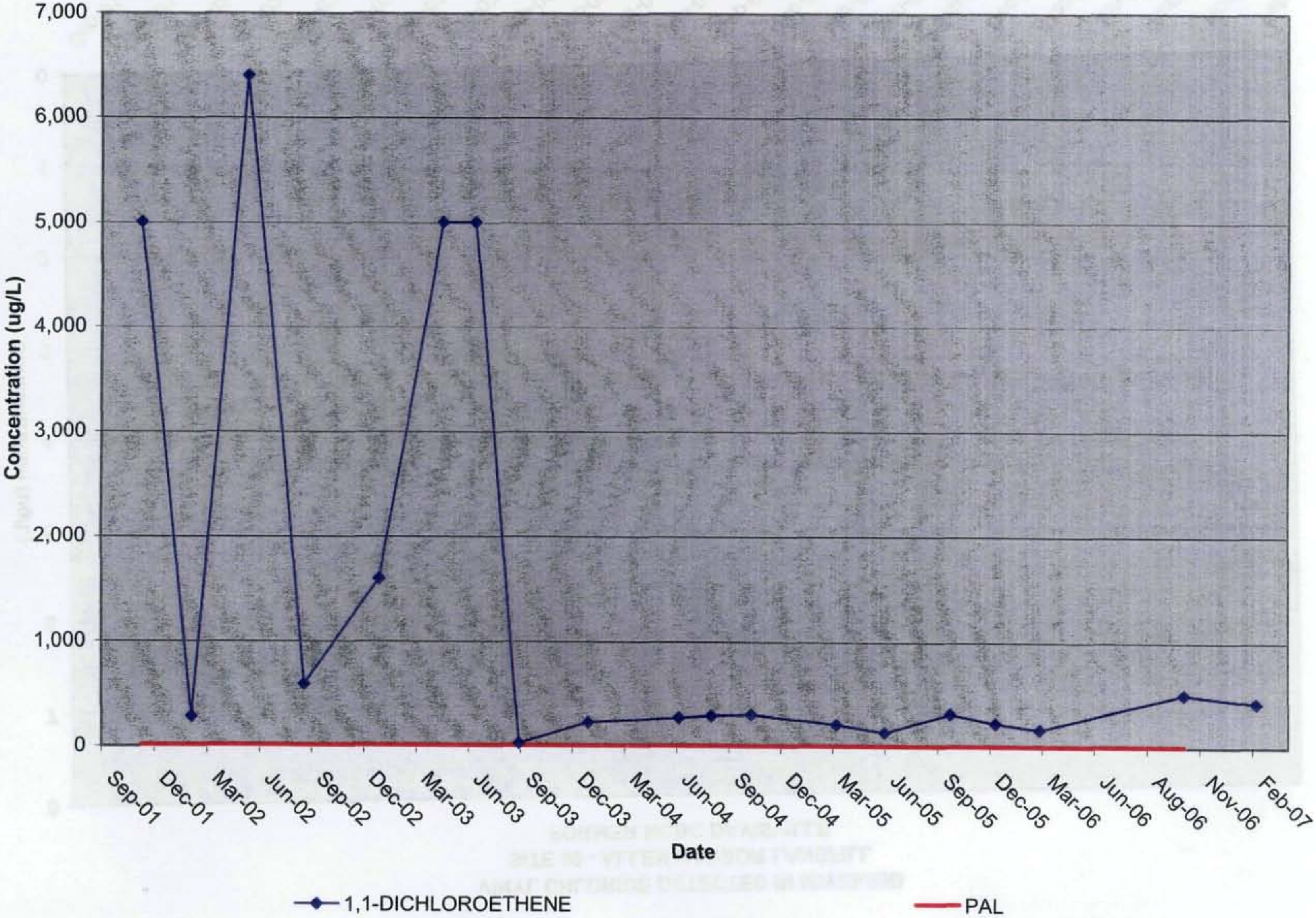


FIGURE D-18

VINYL CHLORIDE DETECTED IN MW09-20D
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

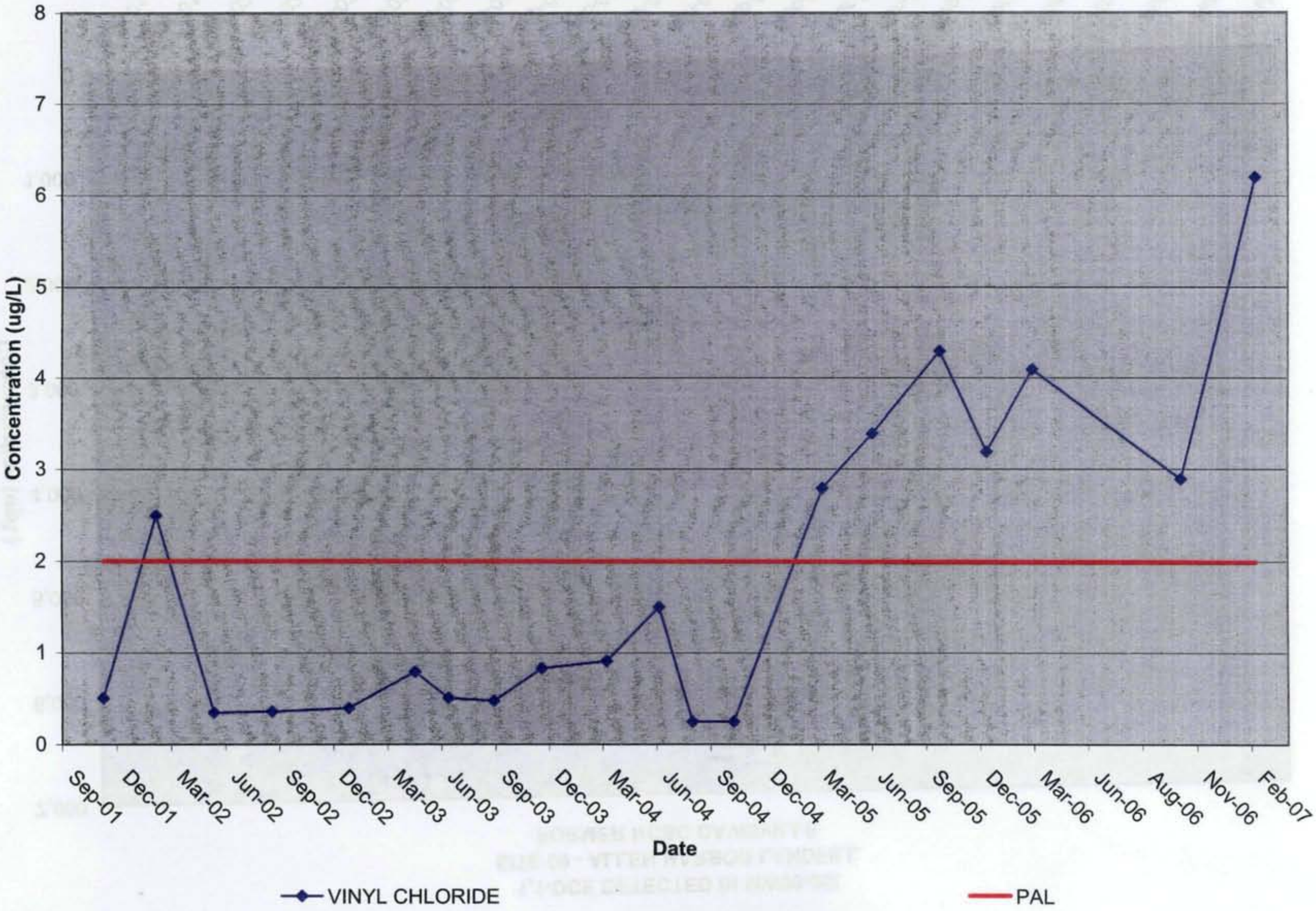


FIGURE D-19

BENZENE DETECTED IN MW09-21S
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

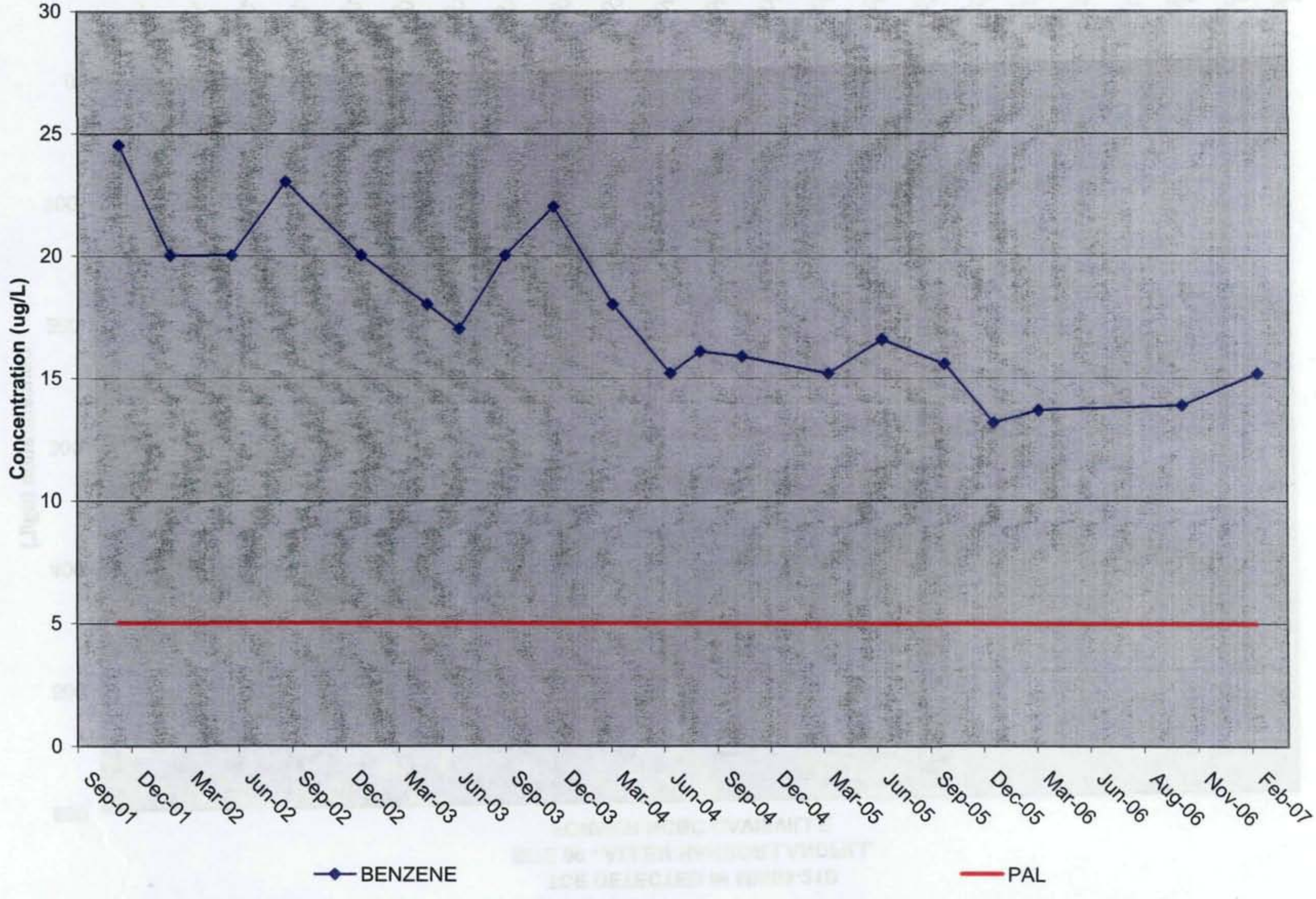


FIGURE D-20

TCE DETECTED IN MW09-21D
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

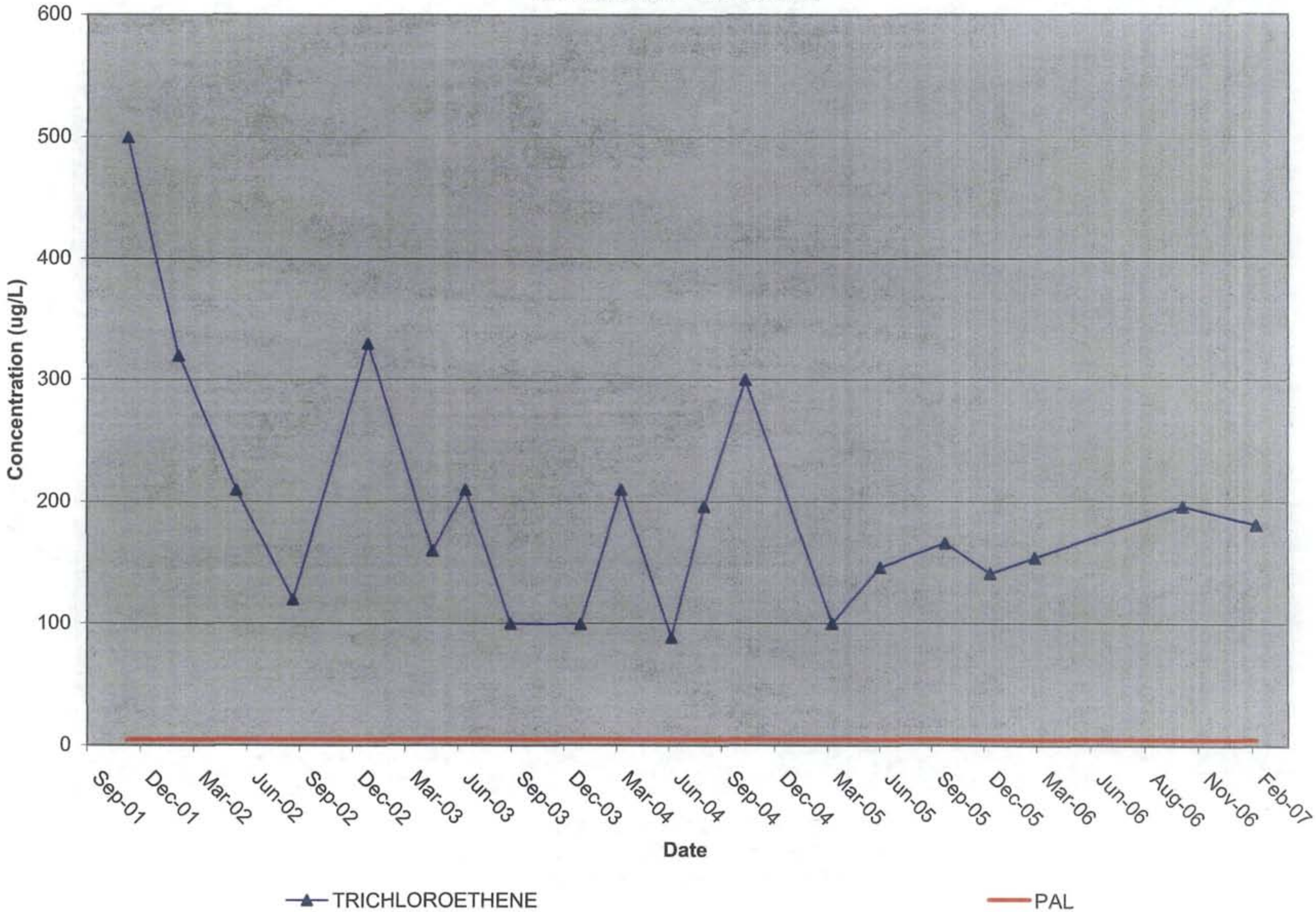


FIGURE D-21

CIS-1,2-DCE DETECTED IN MW09-21D
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

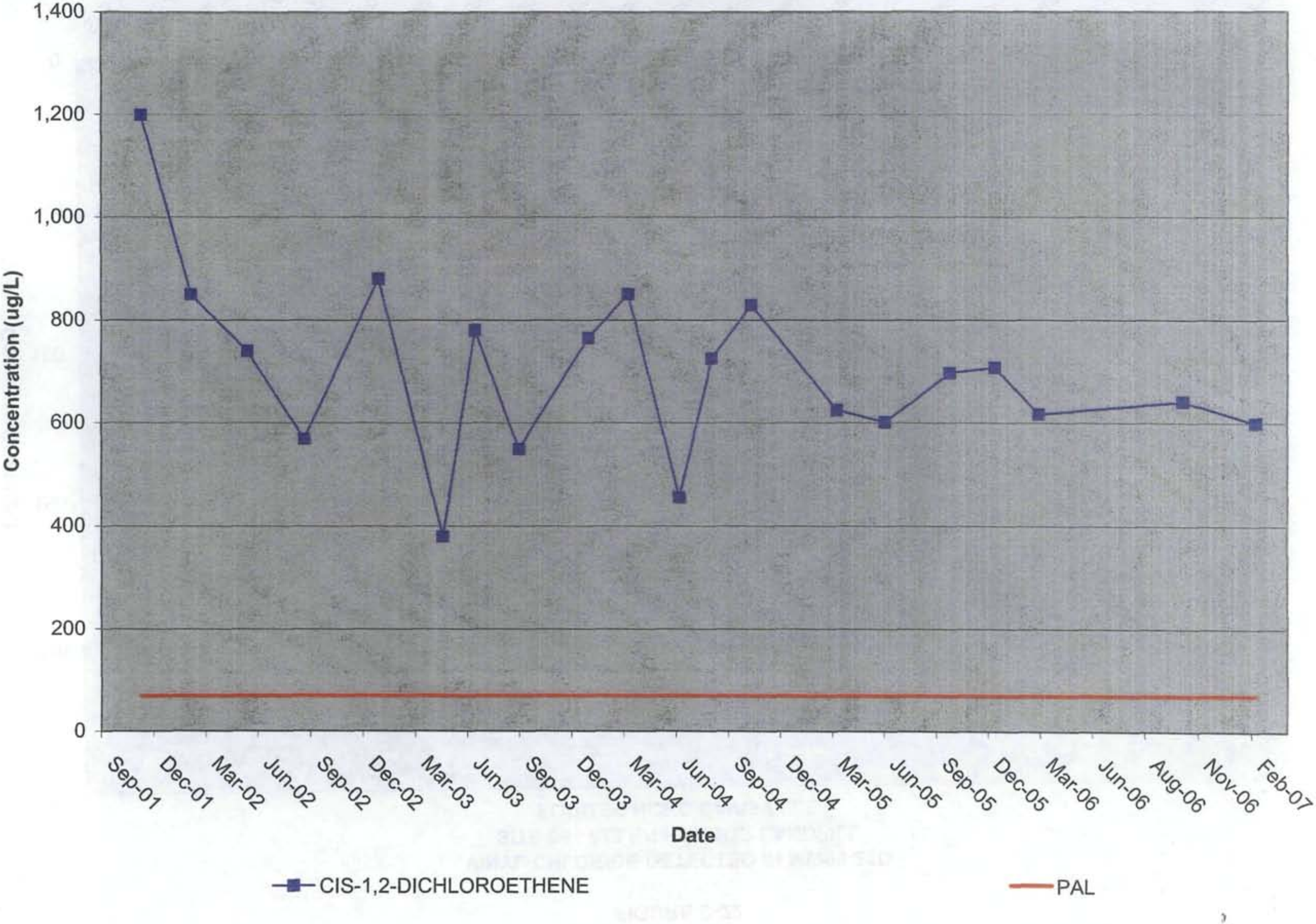


FIGURE D-22

VINYL CHLORIDE DETECTED IN MW09-21D
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

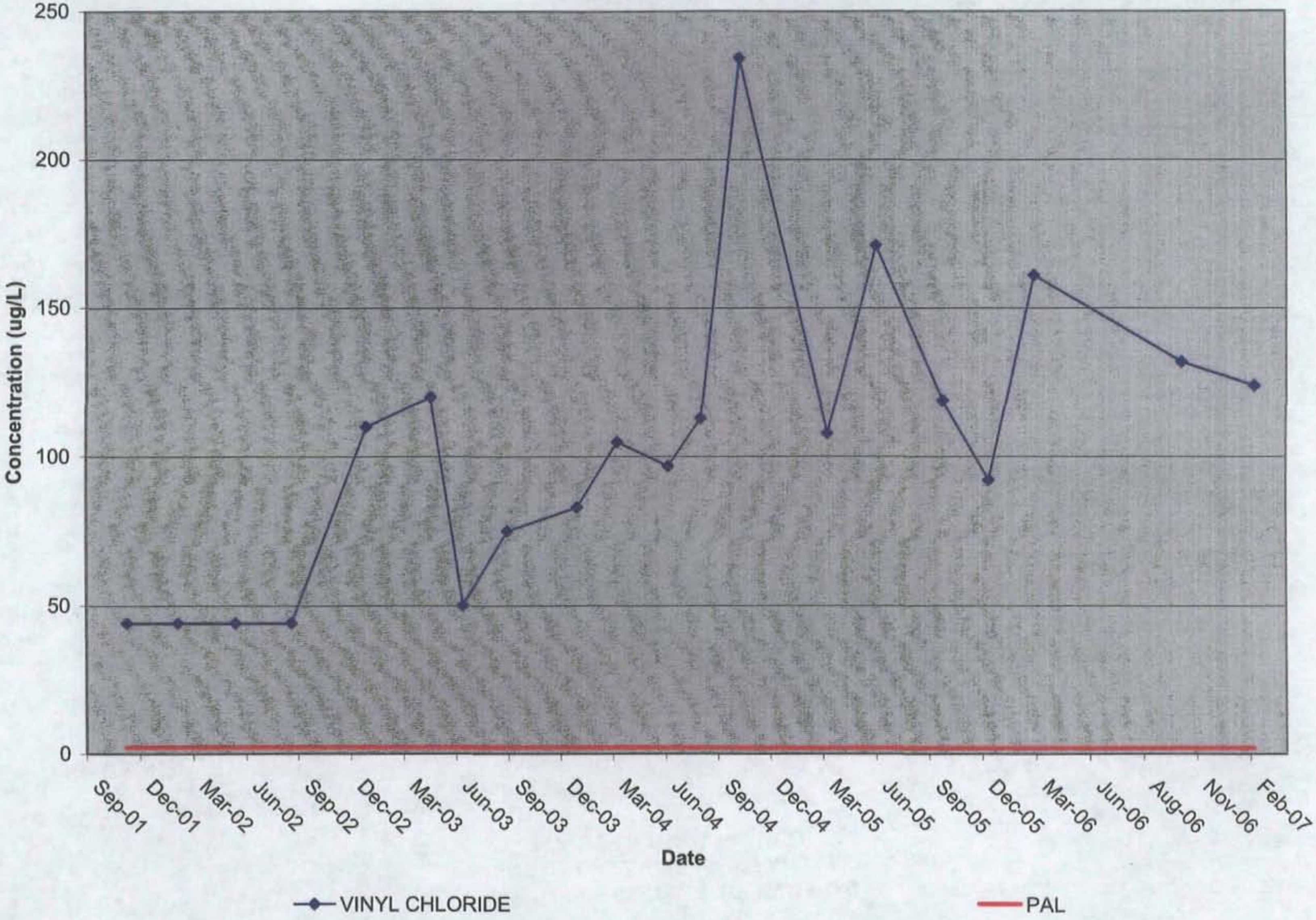


FIGURE D-23

BENZENE DETECTED IN MW09-21D
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

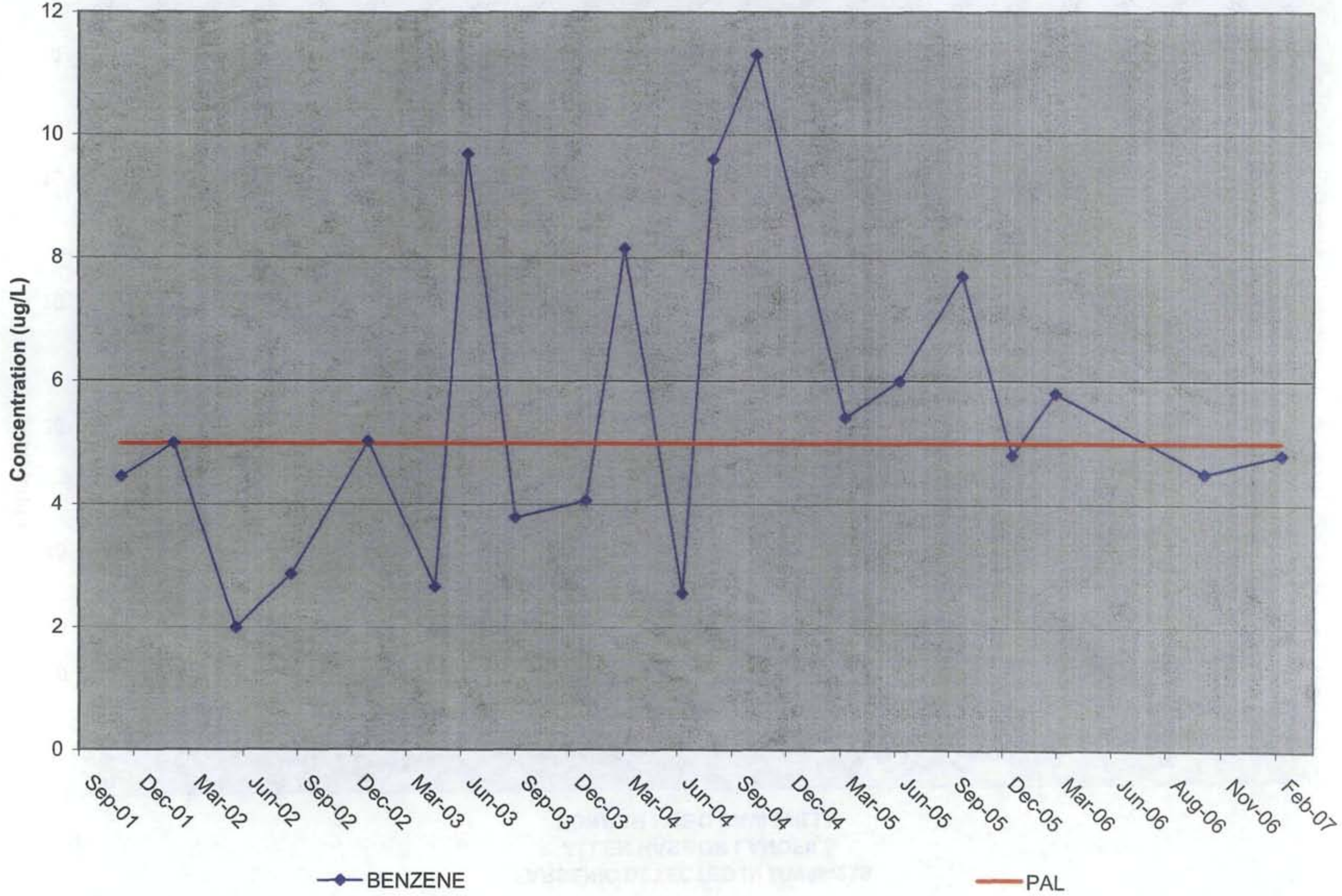


FIGURE D-24

ARSENIC DETECTED IN MW09-23S
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

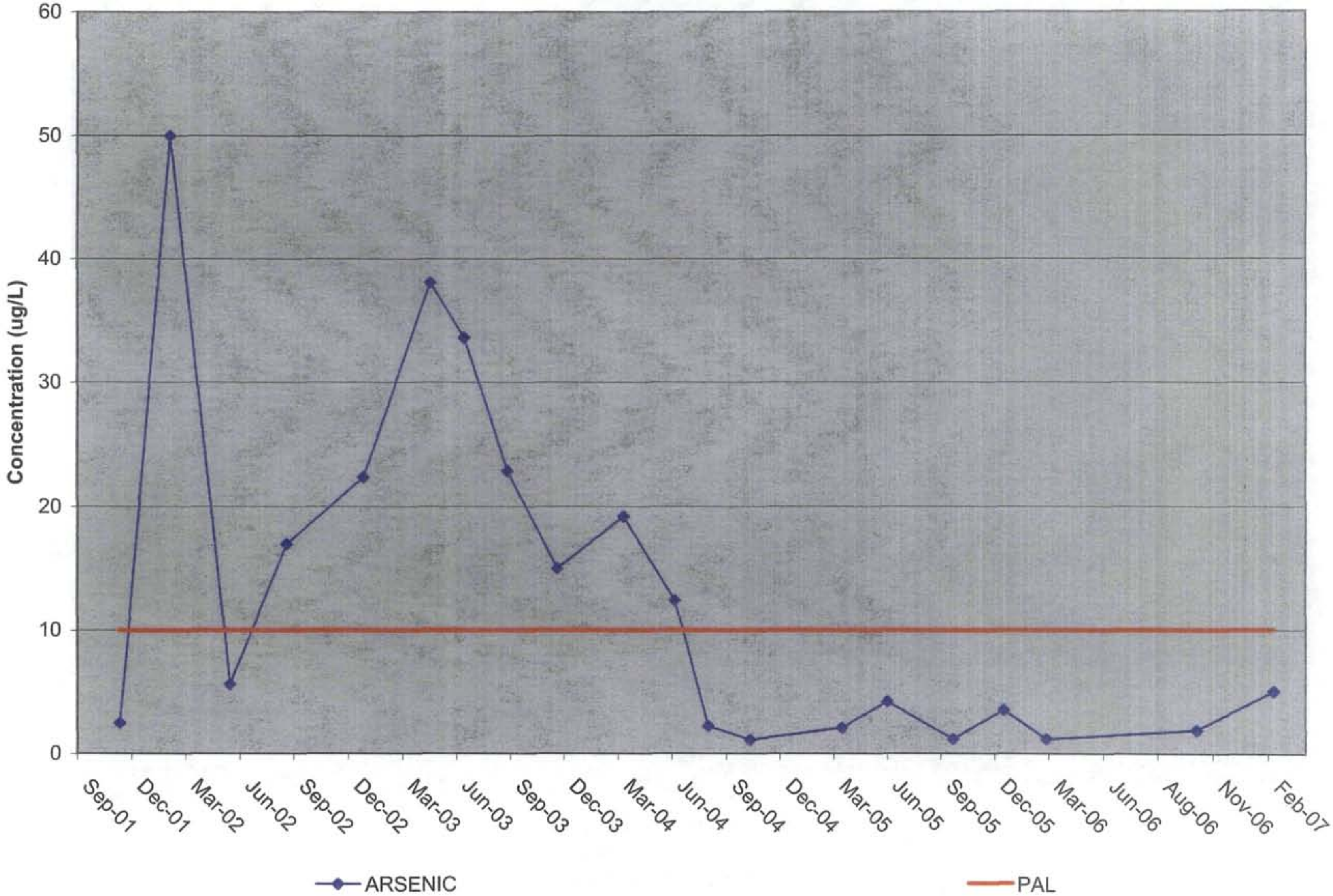


FIGURE D-25

ARSENIC DETECTED IN MW09-24D
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

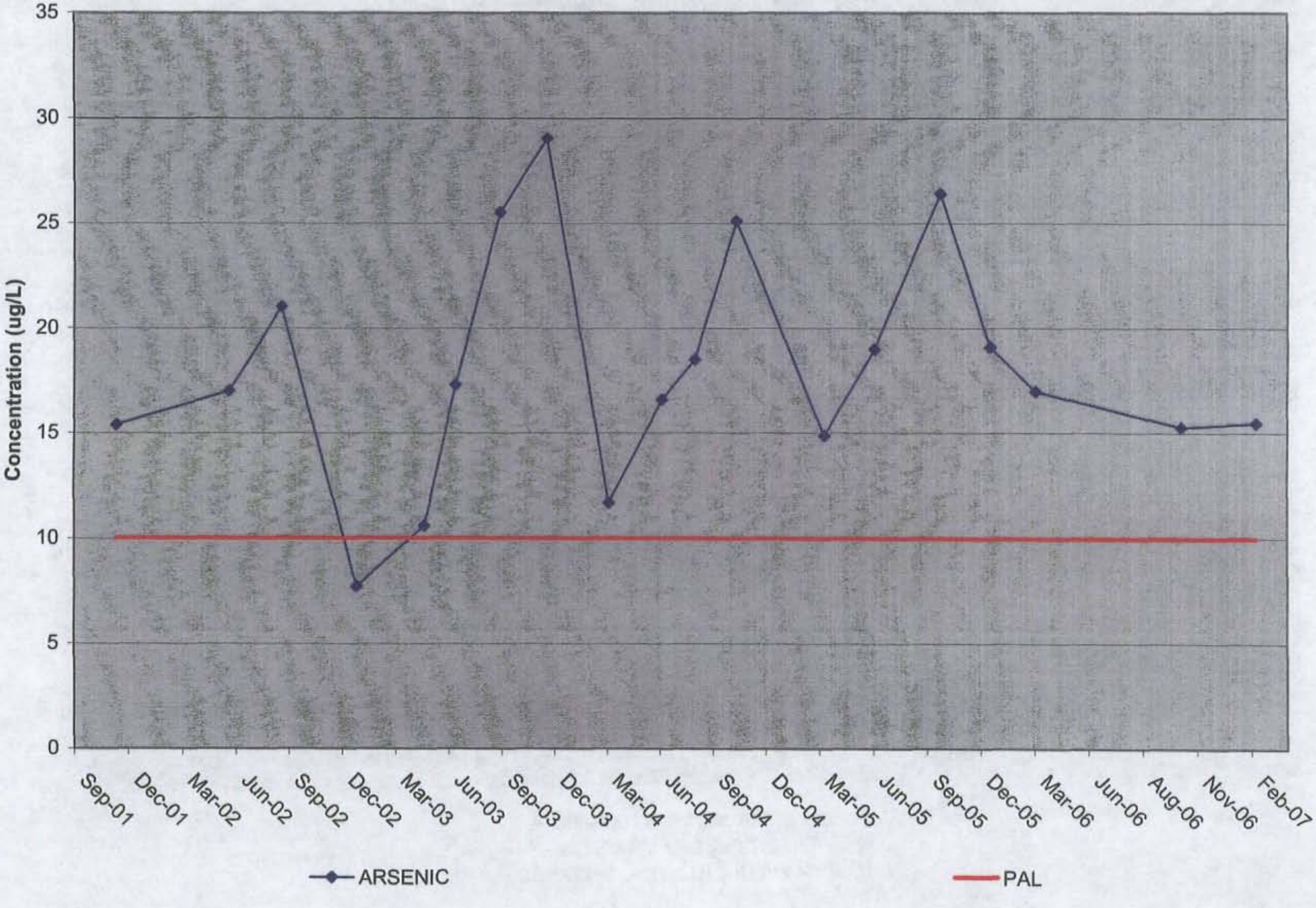


FIGURE D-26

BENZENE DETECTED IN MW09-25S
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

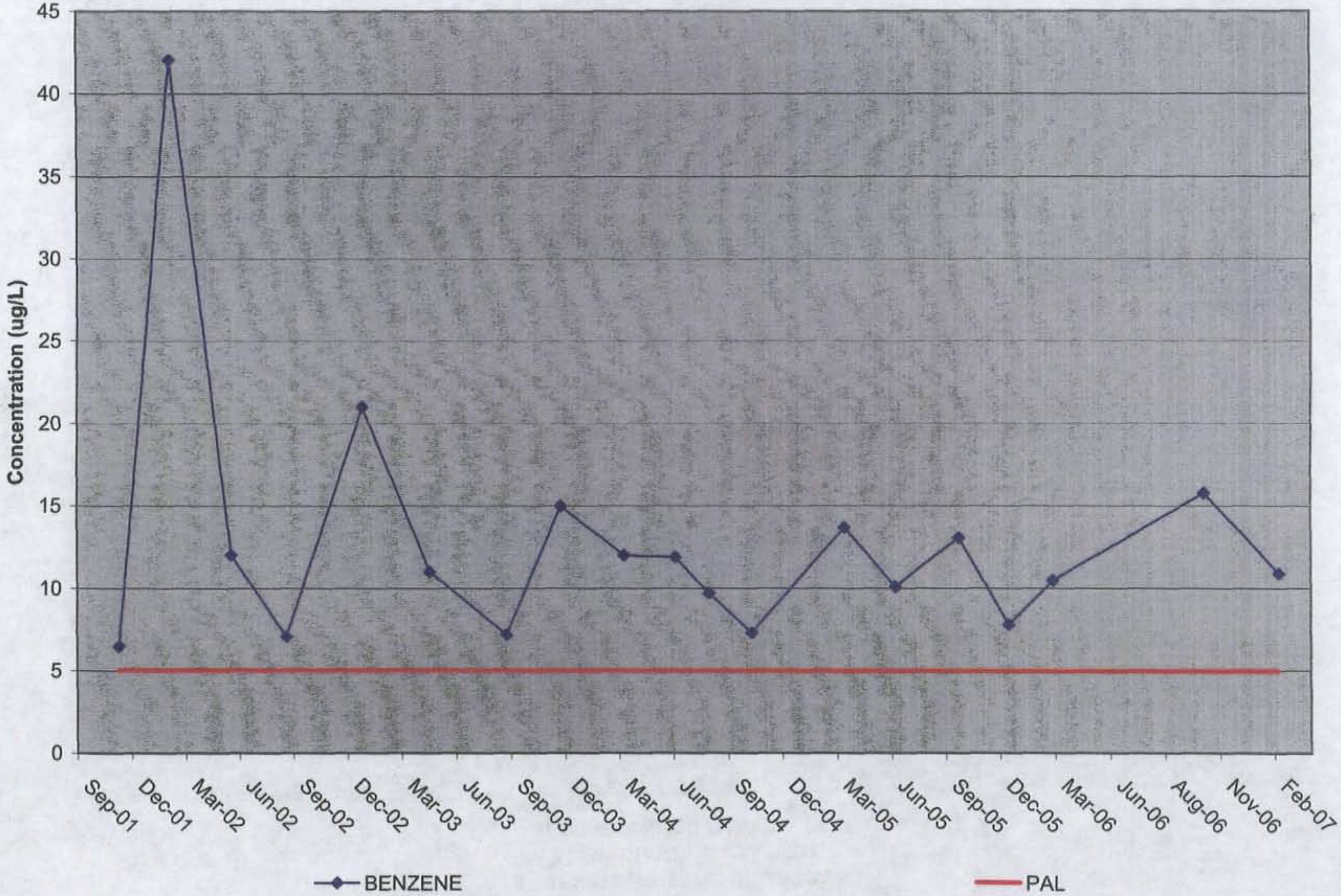


FIGURE D-27

TOTAL 1,2-DCE DETECTED IN P09-08
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

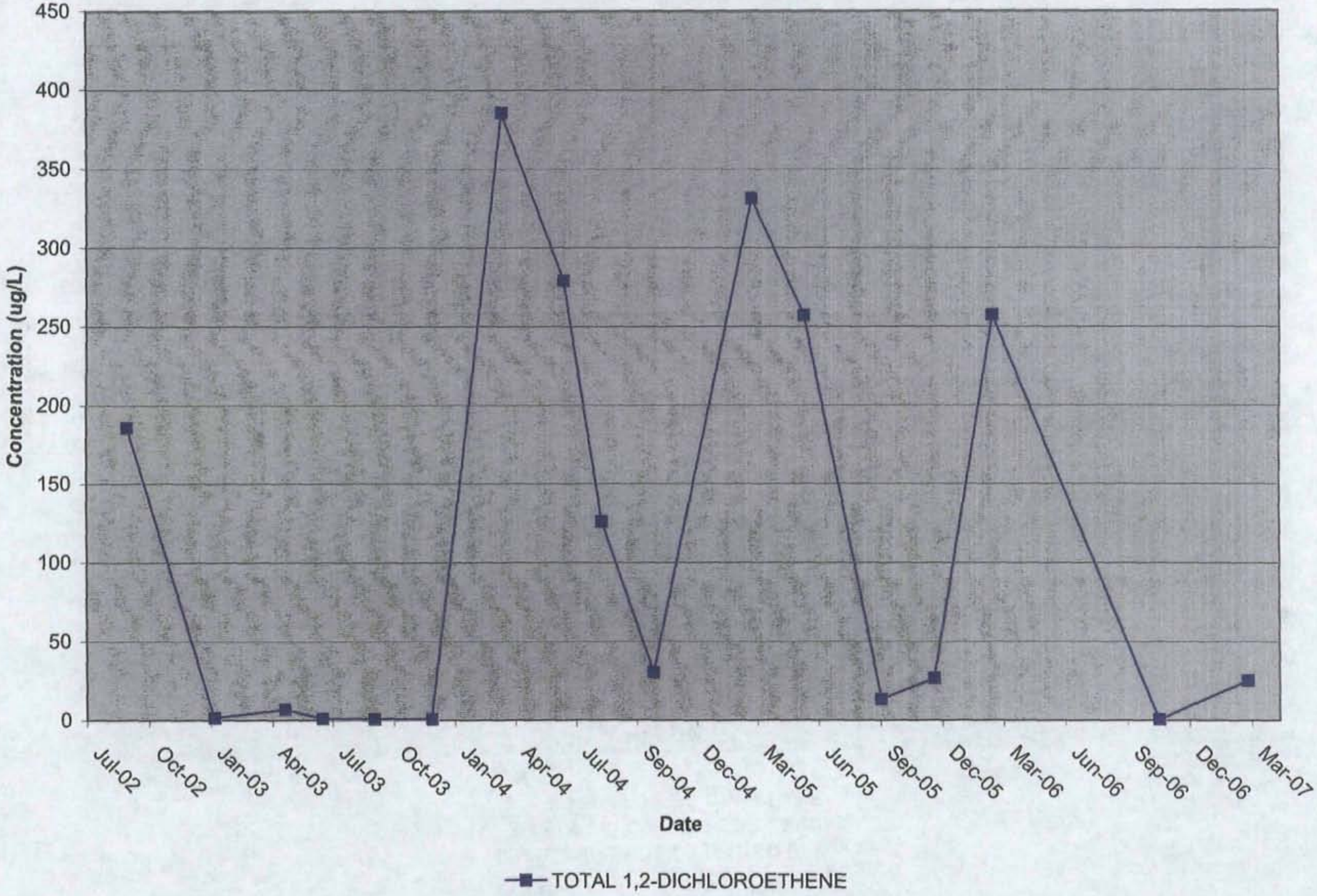


FIGURE D-28

VINYL CHLORIDE DETECTED IN P09-08
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

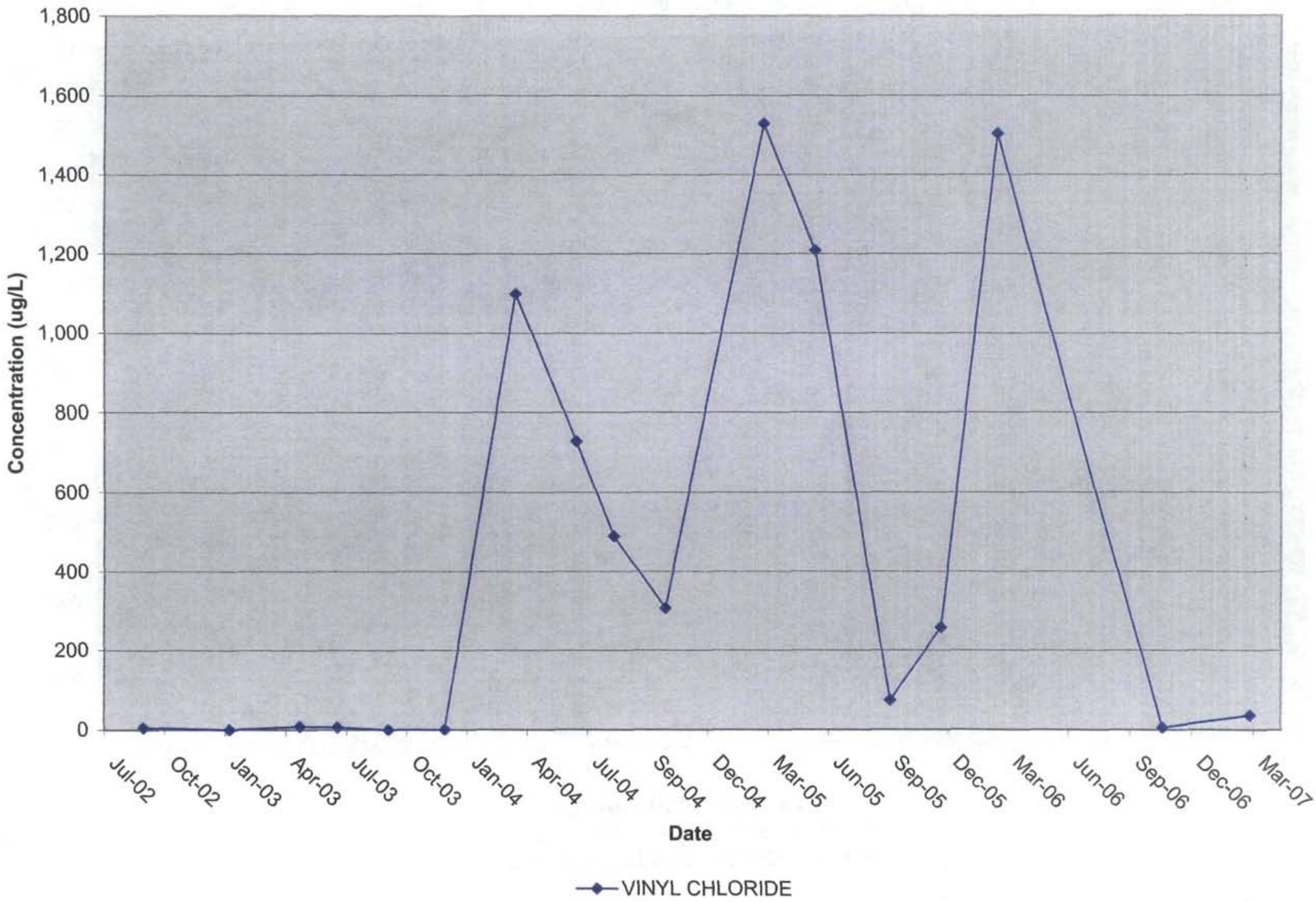


FIGURE D-29

VINYL CHLORIDE DETECTED IN P09-10
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE

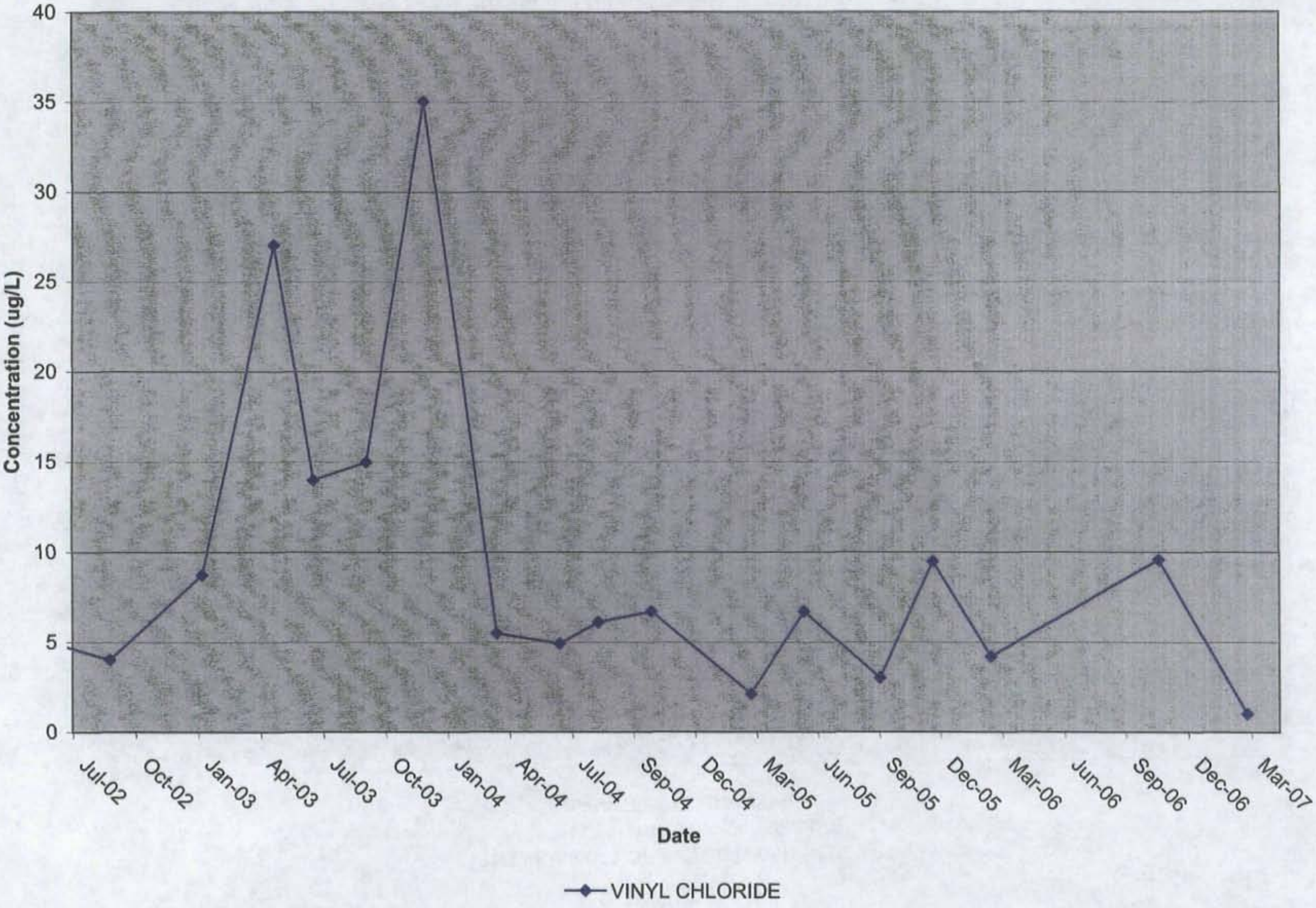
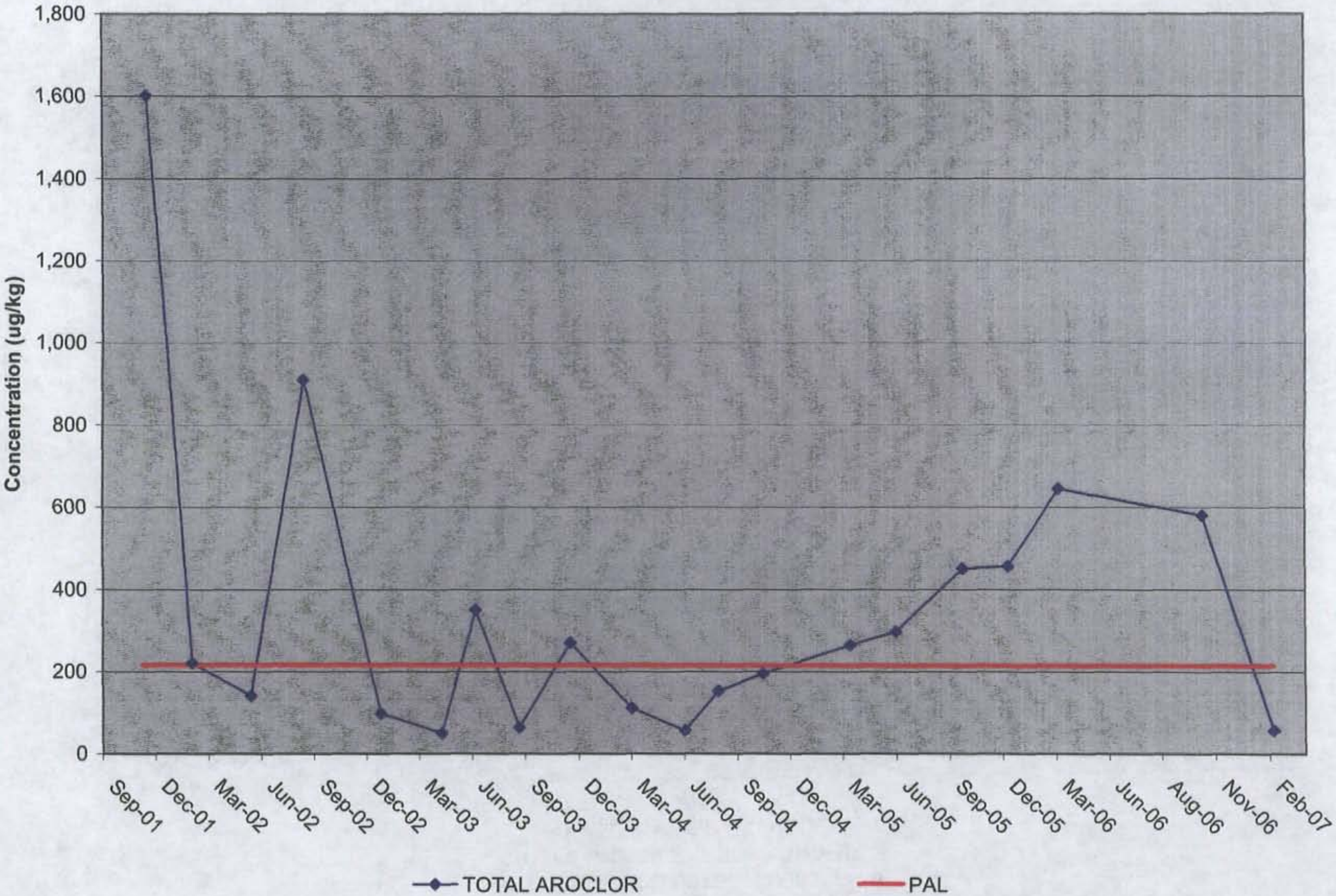


FIGURE D-30

TOTAL AROCLOR DETECTED IN SED09-01
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE



APPENDIX E

ALLEN HARBOR LANDFILL ANNUAL SETTLEMENT SURVEY RESULTS

TABLE E-1

SUMMARY OF ANNUAL LANDFILL SETTLEMENT SURVEY RESULTS
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

GAS VENT	MP Elevation Oct-99	MP Elevation Apr-00	MP Elevation Dec-01	MP Elevation May-03	MP Elevation Aug-05	MP Elevation Nov-06	MP Elevation Jan-08	MP Elevation Change
GV09-01	27.34	27.33	27.23	27.14	27.31	27.31	27.27	-0.20
GV09-02	31.97	31.93	31.88	31.83	31.94	31.89	31.91	-0.14
GV09-03	30.98	30.92	30.73	30.76	30.89	30.84	30.86	-0.25
GV09-04	30.11	30.06	30.01	29.91	30.10	30.06	30.05	-0.20
GV09-05	26.02	25.97	25.93	25.87	26.03	25.94	25.95	-0.15

MONITORING WELL	PVC Elevation Oct-99	PVC Elevation Apr-00	PVC Elevation Dec-01	PVC Elevation May-03	PVC Elevation Nov-05	PVC Elevation Nov-06	PVC Elevation Jan-08	PVC Elevation Change
MW09-02S	12.53	12.58	12.56	12.43	12.54	12.53	12.57	-0.10
MW09-03D	12.55	12.58	12.54	12.46	12.58	12.55	12.57	-0.09
MW09-05S	19.51	19.53	19.40	19.32	19.48	19.47	19.47	-0.19
MW09-07S	25.83	25.80	25.75	25.67	25.79	25.75	25.75	-0.16
MW09-08S	19.76	19.73	19.50	19.43	19.56	19.53	19.54	-0.33
MW09-09S	25.20	25.15	25.04	24.97	25.09	25.04	25.03	-0.23
MW09-09D	25.46	25.41	25.36	25.24	25.38	25.32	25.31	-0.22
MW09-10S	22.90	22.87	22.82	22.73	22.80	22.82	22.83	-0.17
MW09-10D	23.14	23.12	23.08	22.71	23.08	23.09	23.09	-0.43
MW09-11S	16.92	16.89	16.63	16.47	16.68	16.63	16.64	-0.45
MW09-14D	26.53	26.53	26.50	26.43	26.58	26.53	26.52	-0.10
MW09-14I	26.75	26.75	26.81	26.76	26.88	26.84	26.84	0.13
MW09-17I	26.80	26.78	26.72	26.63	26.77	26.70	26.83	-0.17
MW09-20I	23.40	23.39	23.35	23.30	23.42	23.38	23.39	-0.10
MW09-20D	22.28	22.28	22.19	22.14	22.26	22.23	22.26	-0.14
MW09-21D	21.23	21.28	20.92	20.80	20.98	20.96	20.97	-0.43
MW09-21S	20.75	20.75	20.61	20.49	20.67	20.63	20.65	-0.26
MW09-23S	25.04	25.06	25.04	24.96	25.07	25.04	25.04	-0.08
MW09-23D	24.88	24.90	24.89	24.82	24.95	24.92	24.93	0.07
MW09-24D	11.21	11.20	11.09	10.95	11.20	11.21	11.20	-0.26
MW09-24S	11.43	11.41	11.25	11.13	11.41	11.41	11.41	-0.30
MW09-25S	NM	NM	10.90	10.76	11.05	11.00	11.01	0.15
MW09-26D	NM	NM	NM	NM	NM	NM	12.26	NC
MW09-26S	NM	NM	NM	NM	NM	NM	12.11	NC
MW09-27D	NM	NM	NM	NM	NM	NM	6.89	NC
MW09-27S	NM	NM	NM	NM	NM	NM	6.86	NC

TABLE E-1

SUMMARY OF ANNUAL LANDFILL SETTLEMENT SURVEY RESULTS
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND
PAGE 2 OF 3

MONITORING WELL	Steel Elevation Oct-99	Steel Elevation Apr-00	Steel Elevation Dec-01	Steel Elevation May-03	Steel Elevation Nov-05	Steel Elevation Nov-06	Steel Elevation Jan-08	Steel Elevation Change
MW09-02S	12.93	12.96	12.94	NM	12.92	12.90	12.95	-0.03
MW09-03D	12.89	12.90	12.85	NM	12.87	12.86	12.89	-0.04
MW09-05S	20.03	20.02	19.88	NM	19.94	19.94	19.94	-0.15
MW09-07S	26.21	26.14	26.08	NM	26.12	26.08	26.08	-0.13
MW09-08S	19.96	19.97	19.86	NM	19.92	19.89	19.91	-0.10
MW09-09S	25.68	25.63	25.52	NM	25.59	25.52	25.51	-0.17
MW09-09D	25.86	25.81	25.74	NM	25.77	25.71	25.69	-0.17
MW09-10S	23.28	23.27	23.22	NM	23.22	23.23	23.24	-0.07
MW09-10D	23.44	23.44	23.39	NM	23.40	23.40	23.42	-0.05
MW09-11S	17.12	17.08	17.05	NM	17.08	17.04	17.05	-0.08
MW09-14D	26.75	26.73	26.68	NM	26.77	26.72	26.72	-0.07
MW09-14I	26.93	26.93	26.88	NM	26.96	26.91	26.91	-0.05
MW09-17I	27.10	27.08	27.03	NM	27.08	27.02	27.02	-0.08
MW09-20I	23.64	23.61	23.49	NM	23.56	23.51	23.53	-0.15
MW09-20D	22.60	22.61	22.52	NM	22.59	22.56	22.58	-0.08
MW09-21D	21.33	21.36	21.24	NM	21.30	21.27	21.28	-0.09
MW09-21S	21.11	21.10	20.95	NM	21.01	20.97	21.00	-0.16
MW09-23S	25.26	25.29	25.25	NM	25.28	25.26	25.26	0.03
MW09-23D	25.26	25.29	25.27	NM	25.32	25.30	25.31	0.05
MW09-24D	11.43	11.42	11.28	NM	11.39	11.40	11.40	-0.15
MW09-24S	11.65	11.64	11.48	NM	11.63	11.64	11.64	-0.17
MW09-25S	NM	NM	11.24	NM	11.38	11.34	11.34	0.14
MW09-26D	NM	NM	NM	NM	NM	NM	12.46	NC
MW09-26S	NM	NM	NM	NM	NM	NM	12.56	NC
MW09-27D	NM	NM	NM	NM	NM	NM	7.21	NC
MW09-27S	NM	NM	NM	NM	NM	NM	7.22	NC

TABLE E-1

SUMMARY OF ANNUAL LANDFILL SETTLEMENT SURVEY RESULTS
ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

BREAKWATER	MP Elevation Oct-99	MP Elevation Apr-00	MP Elevation Dec-01	MP Elevation May-03	MP Elevation Aug-05	MP Elevation Nov-06	MP Elevation Jan-08	MP Elevation Change
BMP-1831	2.74	2.72	2.71	2.63	2.74	2.68	2.67	-0.11
BMP-1832	2.58	2.54	2.36	2.25	2.56	2.46	2.46	-0.33
BMP-1833	2.65	2.64	2.58	2.51	2.67	2.55	2.61	-0.14
BMP-1834	3.11	3.09	3.08	3.02	3.11	3.03	3.08	-0.09
BMP-1835	2.81	2.82	2.72	2.64	2.80	2.72	2.74	-0.17
BMP-1836	2.73	2.72	2.59	2.52	2.70	2.60	2.58	-0.21

REVETMENT	MP Elevation Oct-99	MP Elevation Apr-00	MP Elevation Dec-01	MP Elevation May-03	MP Elevation Aug-05	MP Elevation Nov-06	MP Elevation Jan-08	MP Elevation Change
RMP-50	16.88	16.86	16.84	16.73	16.88	16.74	16.74	-0.15
RMP-51	16.52	16.47	16.38	16.29	16.44	16.28	16.24	-0.28
RMP-52	16.87	16.85	16.71	16.63	16.75	16.68	16.68	-0.24
RMP-60	12.51	12.49	12.47	12.35	NM	12.10	12.06	-0.45
RMP-61	16.81	16.79	16.72	16.64	16.74	16.43	16.47	-0.38
RMP-68	16.39	16.37	16.28	16.21	NM	15.99	15.91	-0.48

WETLAND	MP Elevation Oct-99	MP Elevation Apr-00	MP Elevation Dec-01	MP Elevation May-03	MP Elevation Aug-05	MP Elevation Nov-06	MP Elevation Jan-08	MP Elevation Change
MMP-10	NM	NM	NM	NM	1.76	1.79	1.76	0.00
MMP-11	NM	NM	NM	NM	1.37	1.29	1.24	-0.13
MMP-12	NM	NM	NM	NM	1.64	1.52	1.50	-0.14
MMP-13	NM	NM	NM	NM	1.45	1.44	1.43	-0.02
MMP-14	NM	NM	NM	NM	1.36	1.37	1.32	-0.04
MMP-15	NM	NM	NM	NM	1.11	1.17	1.11	0.00

Notes:

1. MP = Measuring Point
2. NM = Not Measured
3. NC = Not Calculated
4. All measurements in feet

APPENDIX F

ALLEN HARBOR LANDFILL GROUNDWATER ELEVATION GRAPHS

FIGURE F-1

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS IN MW09-02S
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

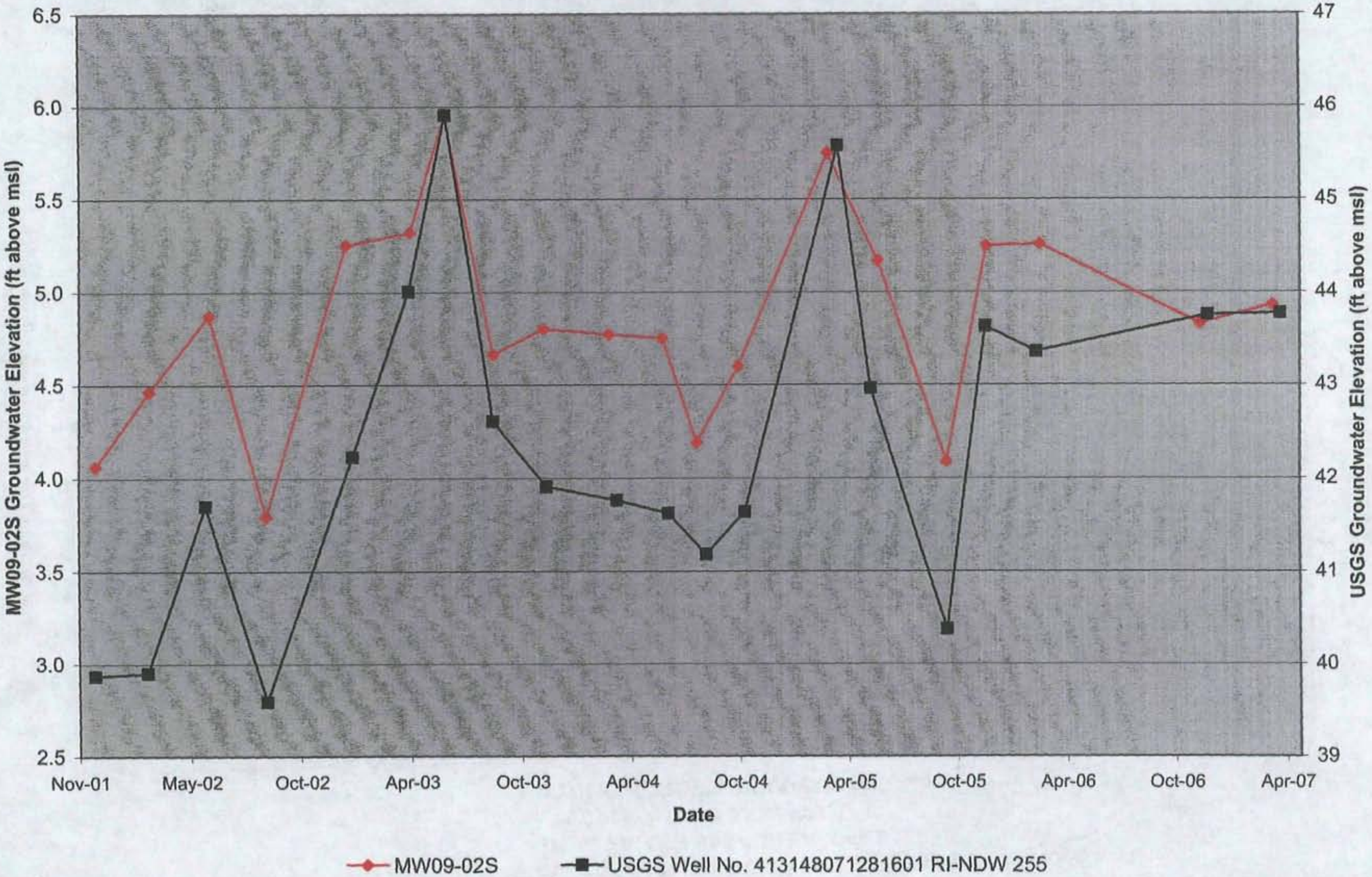


FIGURE F-2

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS IN MW09-05S
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

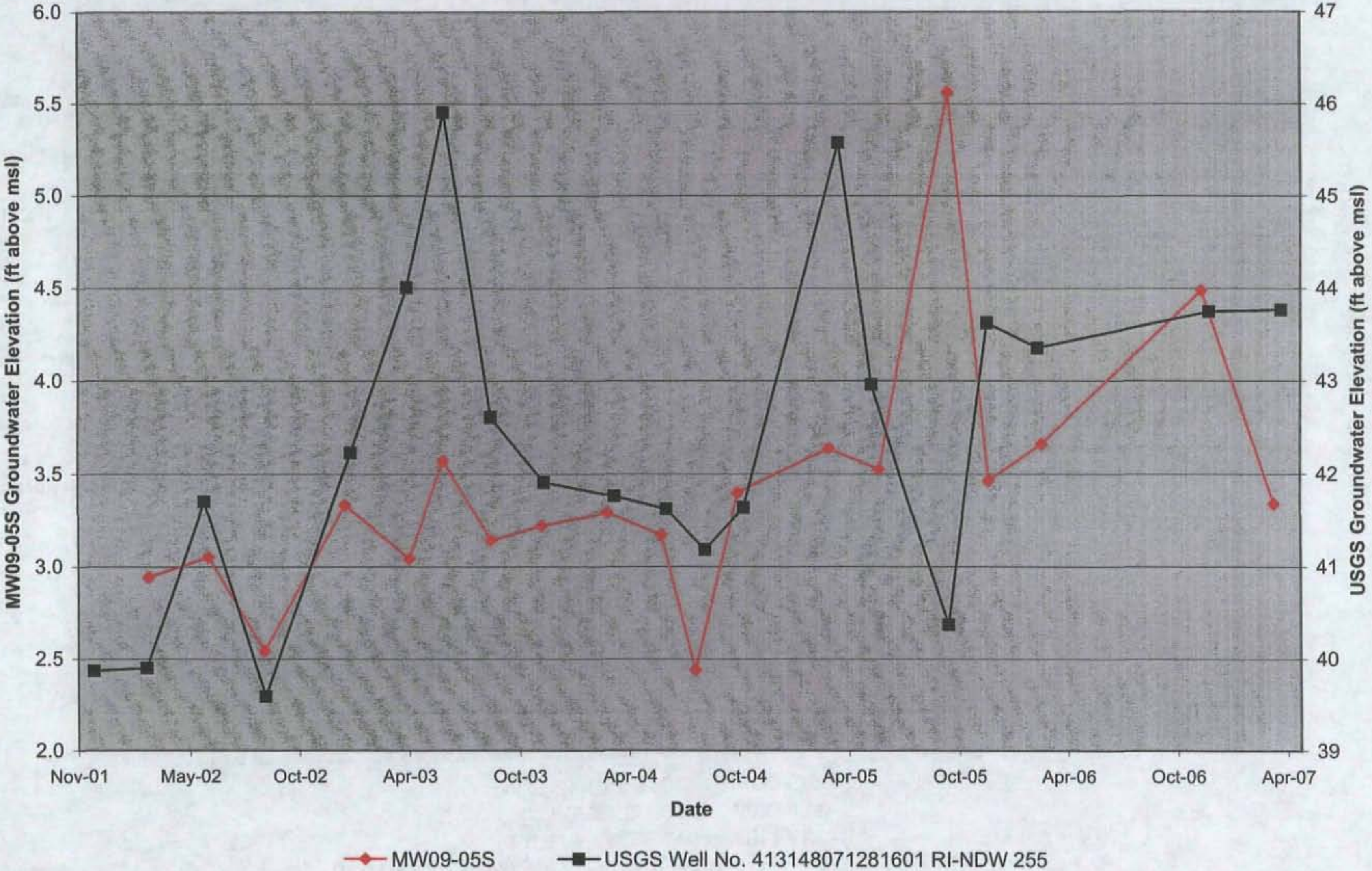


FIGURE F-3

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS IN MW09-07S
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

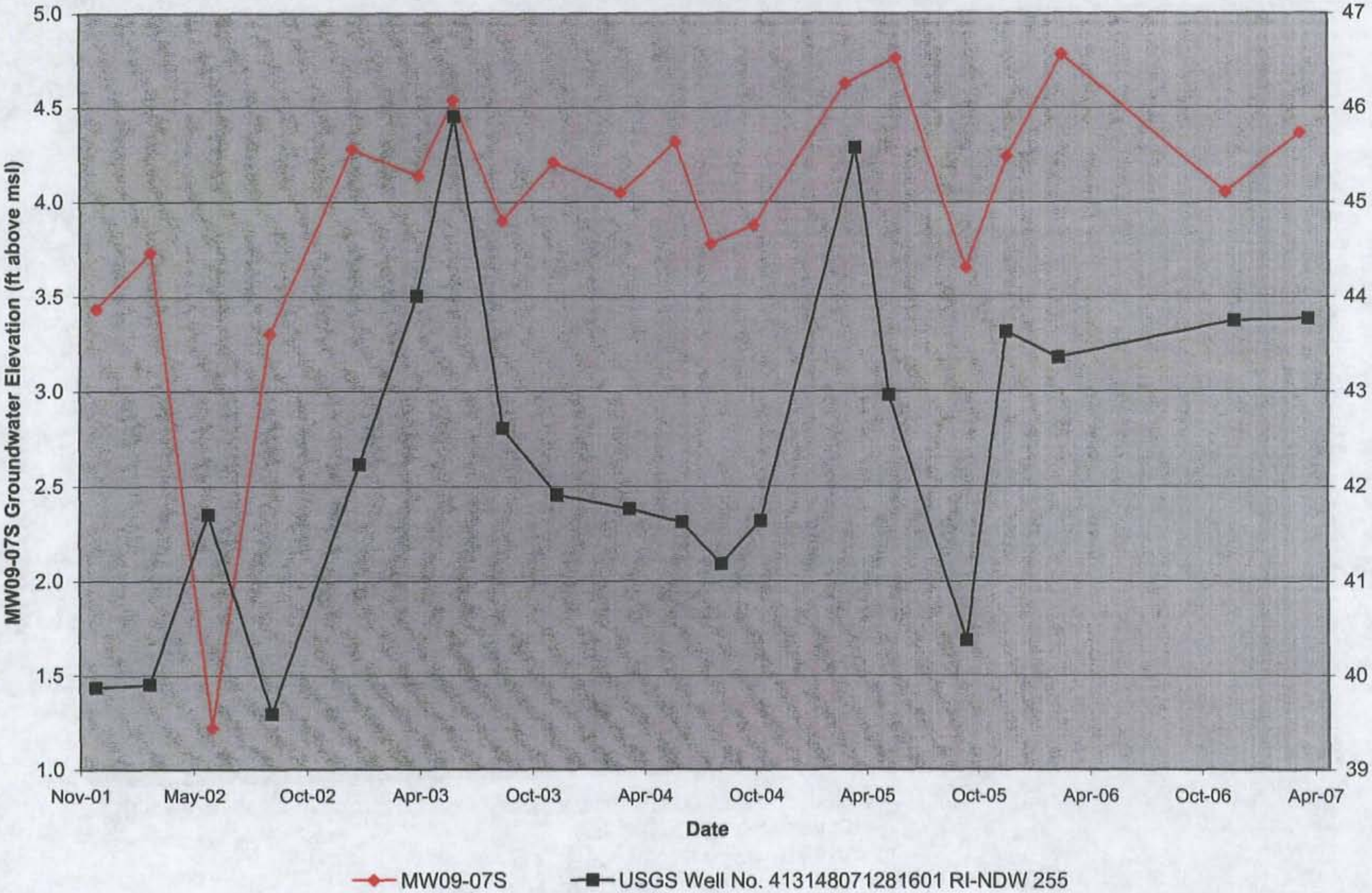


FIGURE F-4

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS IN MW09-08S
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

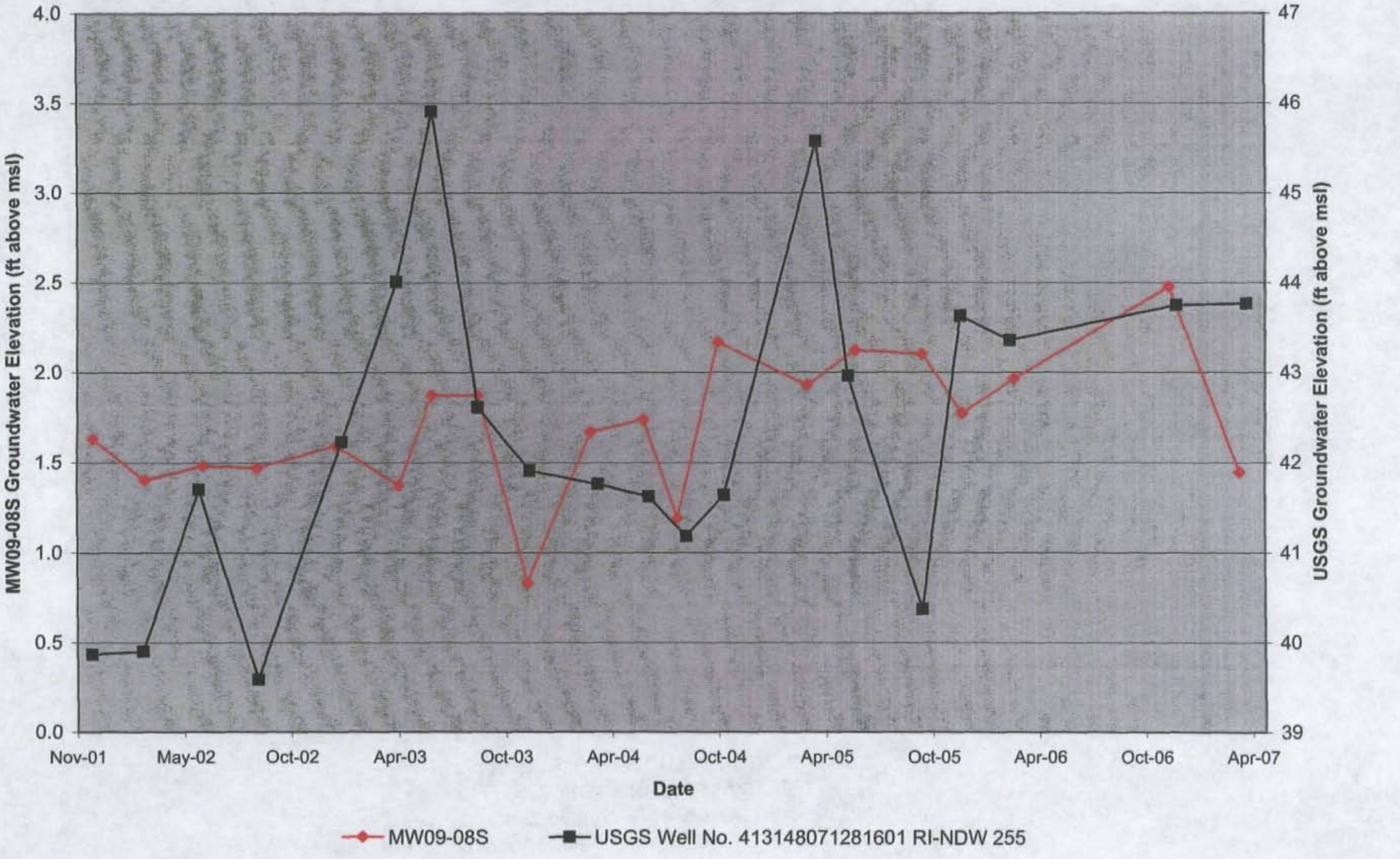


FIGURE F-5

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS IN MW09-09S
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

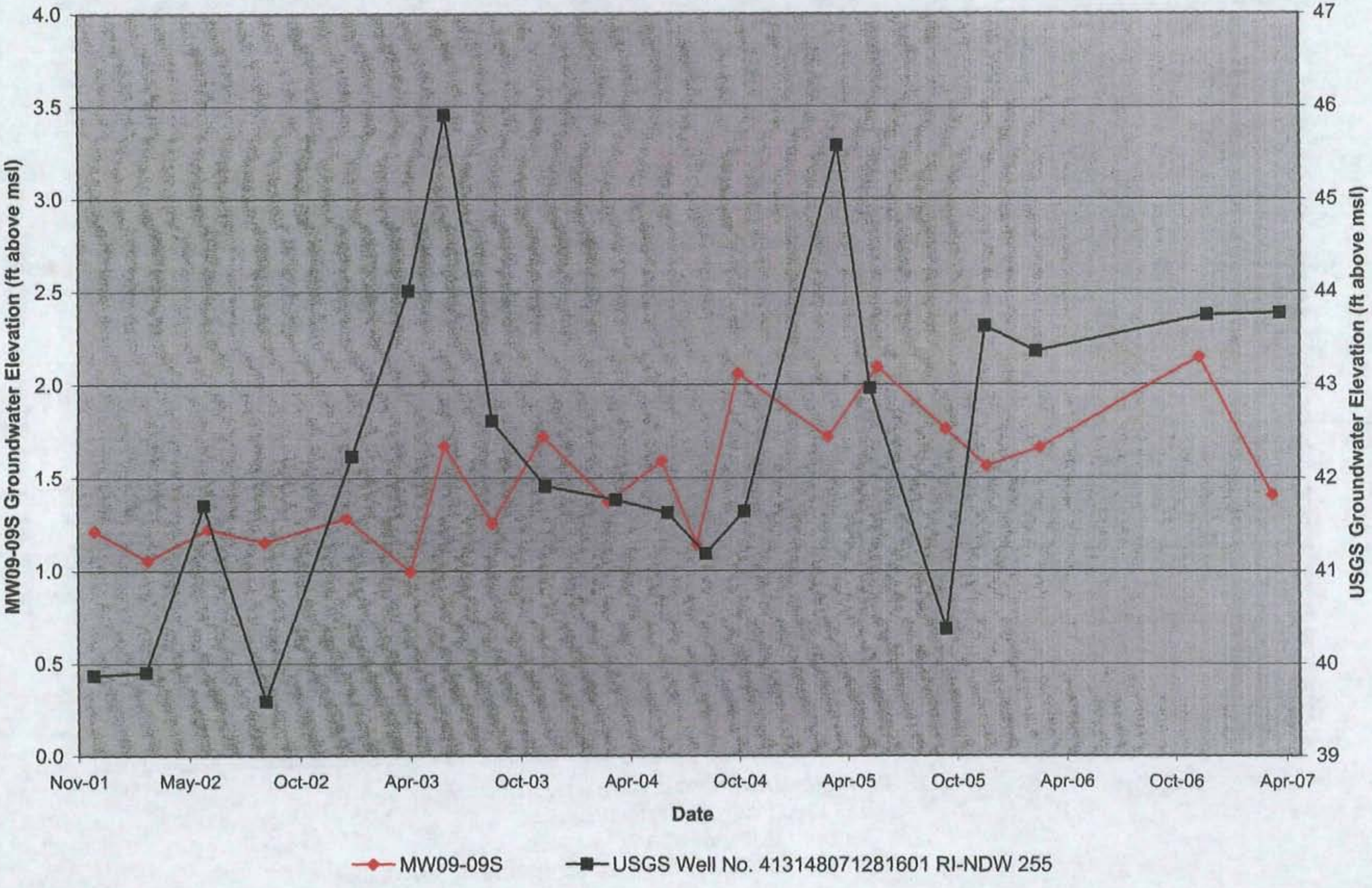


FIGURE F-6

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS IN MW09-10S
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

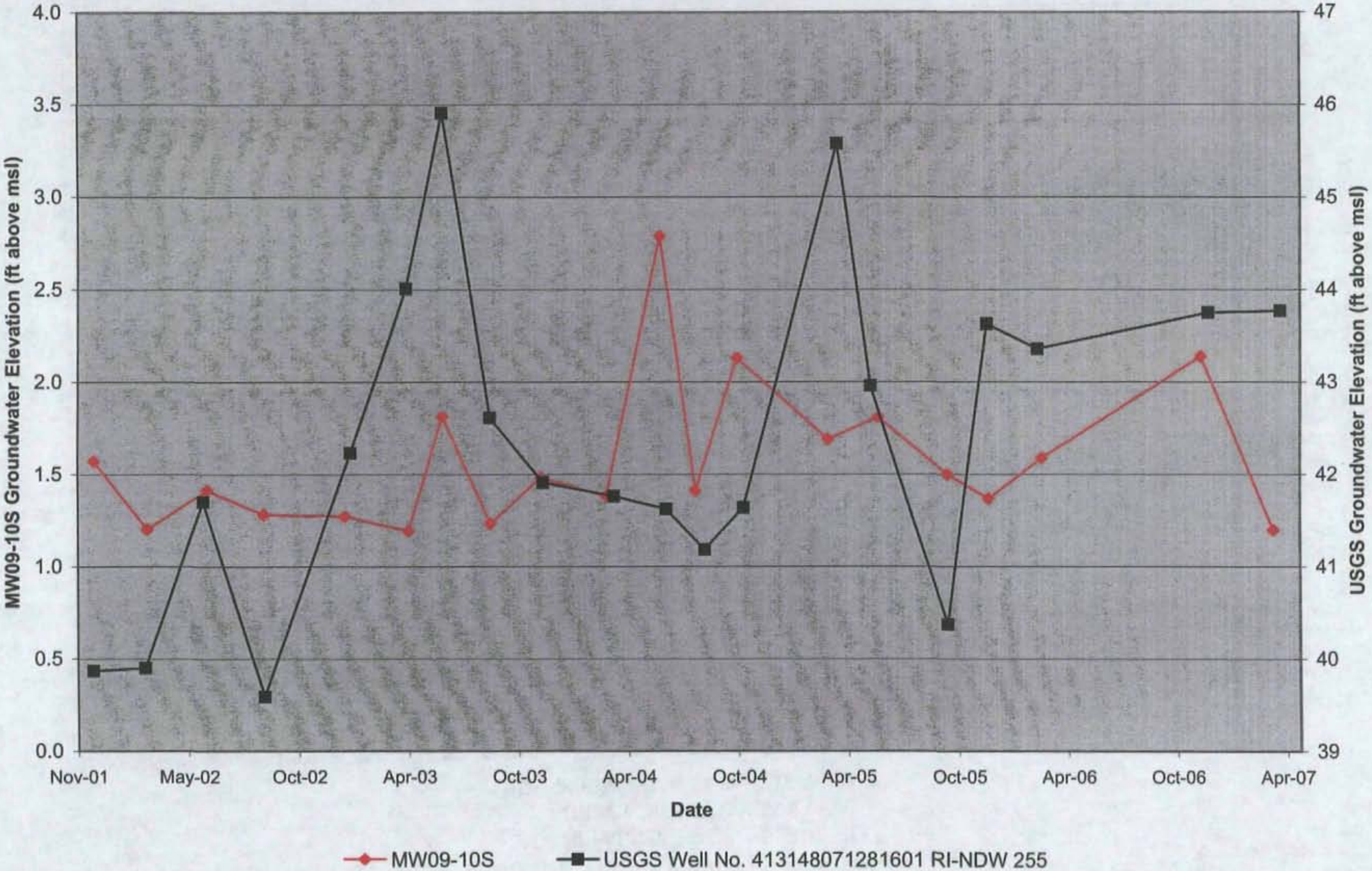


FIGURE F-7

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS IN MW09-11S
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

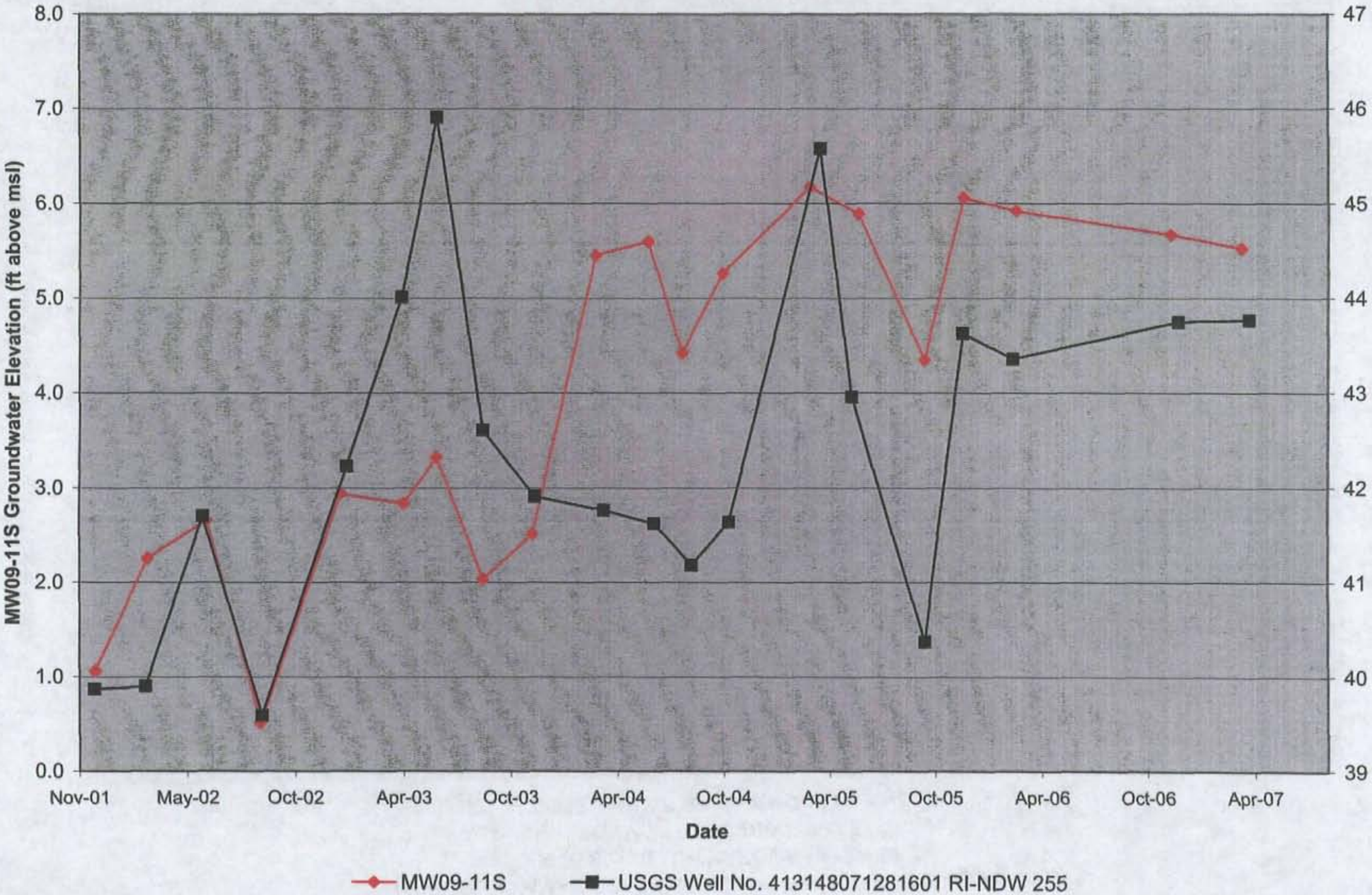


FIGURE F-8

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS IN MW09-21S
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

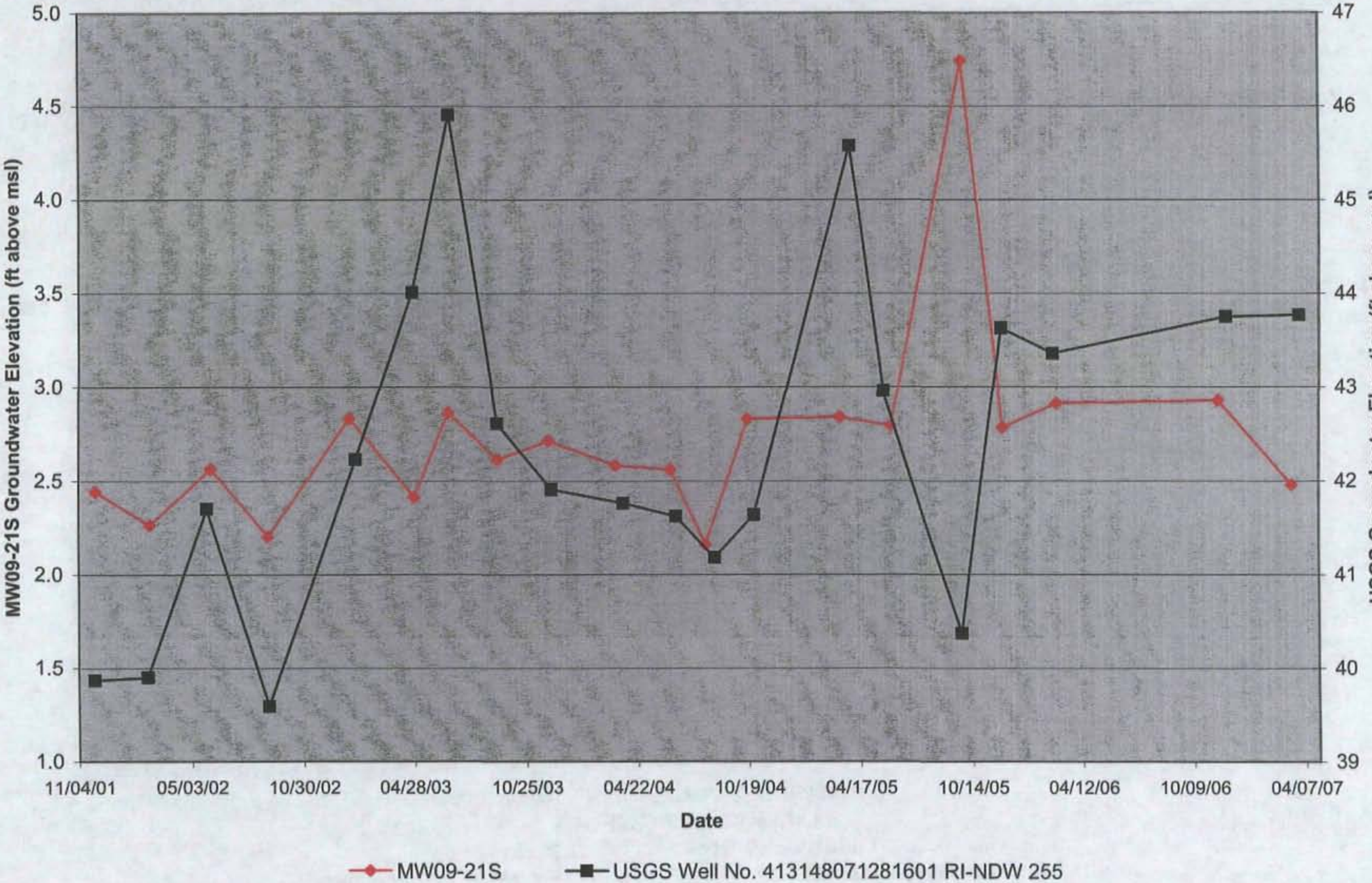


FIGURE F-9

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS IN MW09-23S
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

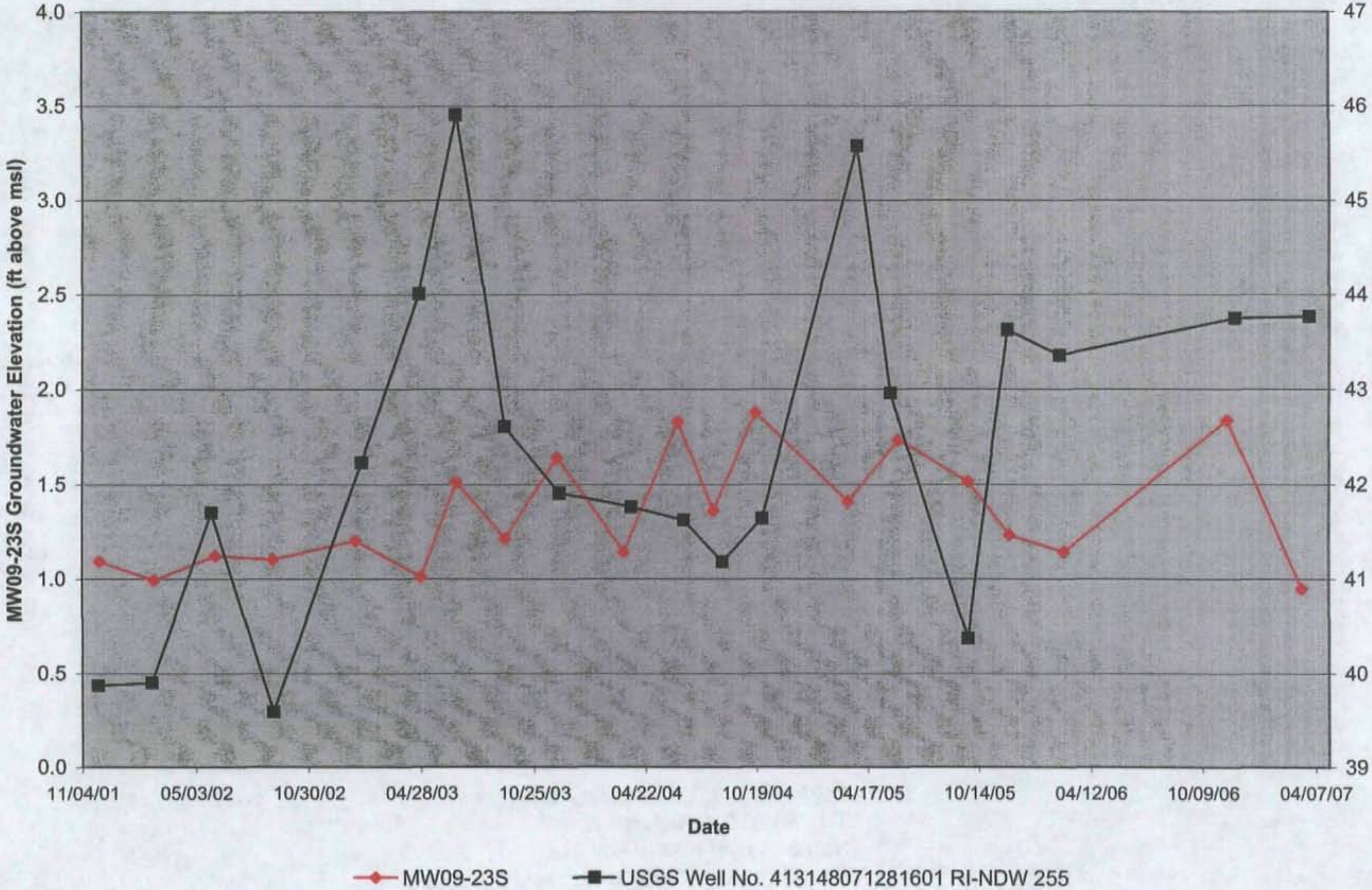


FIGURE F-10

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS IN MW09-24S
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

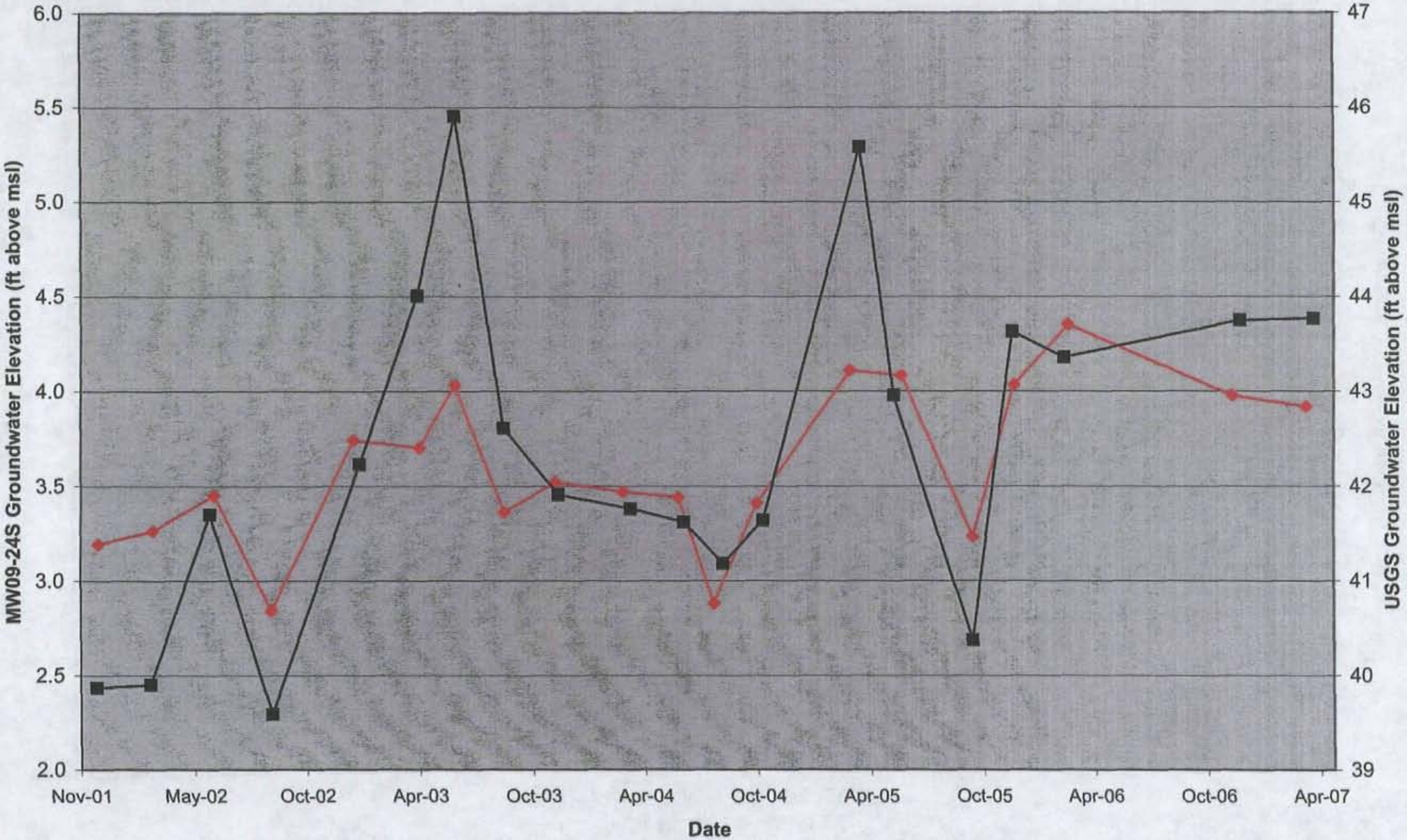
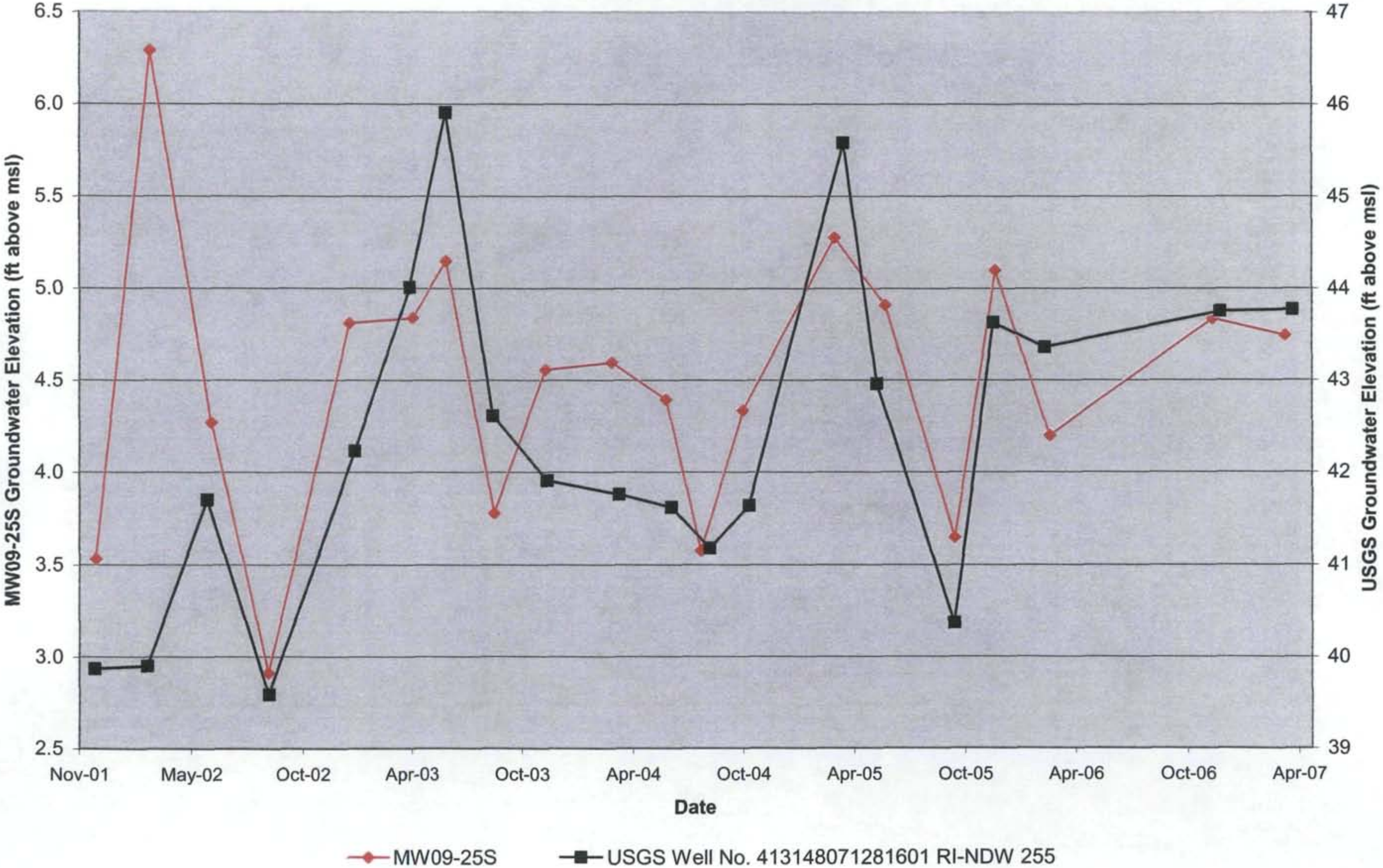


FIGURE F-11

HISTORICAL SUMMARY OF GROUNDWATER ELEVATIONS IN MW09-25S
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND



APPENDIX G

RISK ASSESSMENT SUPPORT DOCUMENTATION

TABLE G-1

SUMMARY OF CANCER RISKS AND HAZARD INDICES
SITE 07 - CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

Scenario	Case	Incremental Lifetime Cancer Risk[1]				Hazard Index[1]		
		Child	Adolescent	Adult	Lifelong	Child	Adolescent	Adult
Groundwater								
Shell Fisherman	Case 1	NA	3E-06	5E-06	8E-06	NA	0.02	0.02
	Case 2	NA	3E-06	4E-06	7E-06	NA	0.02	0.02
	Case 3	NA	2E-06	4E-06	6E-06	NA	0.02	0.02
	Case 4	NA	9E-08	1E-07	2E-07	NA	0.0003	0.0003
Surface Water								
Swimmer	Case 1	3E-07	6E-07	8E-07	2E-06	0.01	0.005	0.004
	Case 2	8E-07	1E-06	1E-06	2E-06	0.009	0.005	0.004
Shell Fisherman	Case 1	NA	2E-07	2E-07	4E-07	NA	0.001	0.001
	Case 2	NA	3E-07	4E-07	6E-07	NA	0.001	0.001
Sediment								
Swimmer	Case 1	3E-06	2E-06	3E-07	5E-06	0.3	0.06	0.01
Shell Fisherman	Case 1	NA	4E-07	3E-07	8E-07	NA	0.04	0.01
Shellfish								
Ingestion	--	7E-05	2E-04	2E-04	4E-04	91	144	92
Total for Swimmer[2]	--	4E-06	3E-06	2E-06	7E-06	0.3	0.07	0.02
Total for Shell Fisherman[2]	--	NA	2E-04	2E-04	4E-04	NA	144	93
Total for Shell Fisherman Minus Consumption of Fish[2]	--	NA	5E-06	7E-06	1E-05	NA	0.07	0.04

NOTES:

NA - Not an applicable exposure pathway.

1 - Chemicals contributing to an unacceptable risk (ILCR > 1E-05 or HI >1) are presented on Table G-2.

2 - Total risk is the sum of the maximum risk for each case.

TABLE G-2

CHEMICALS OF CONCERN FOR INGESTION OF SHELLFISH
SITE 07 - CALF PASTURE POINT, SHORELINE RISK ASSESSMENT
FORMER NAVAL CONSTRUCTION BATTALION CENTER DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

Chemical of Concern[1]	Impact on Human Receptor
Benzo(a)pyrene	Adolescent ILCR = 2E-06 Adult ILCR = 2E-06
Aroclor-1242	Adolescent ILCR = 2E-06 Adult ILCR = 2E-06
Aroclor-1254	Child ILCR = 4E-06 Child HI = 1 Adolescent ILCR = 1E-05 Adolescent HI = 2 Adult ILCR = 1E-05 Adult HI = 1
Aroclor-1260	Child ILCR = 3E-06 Adolescent ILCR = 6E-06 Adult ILCR = 6E-06
Arsenic	Child ILCR = 6E-05 Child HI = 1 Adolescent ILCR = 1E-04 Adolescent HI = 2 Adult ILCR = 1E-04 Adult HI = 1
Mercury	Child HI = 86 Adolescent HI = 136 Adult HI =.87
Cadmium	Adolescent HI = 1
Silver	Child HI = 0.2 Adolescent HI = 0.3 Adult HI = 0.2

NOTES:

HQ = Hazard Quotient.

ILCR = Incremental Lifetime Cancer Risk

(1) - Any carcinogenic chemical with an ILCR greater than 1.0E-6 or a noncarcinogenic chemical contributing to target organ hazard indices (HI) greater than 1.0.

TABLE G-3

COMPARISON OF CANCER SLOPE FACTORS (CSF) AND NONCARCINOGNENIC REFERENCE DOSES (RfDS) USED IN THE SITE 07 AND 09 RISK ASSESSMENTS WITH CURRENT VALUES
FORMER NCBC DAVISVILLE
NORTH KINGSTOWN, RHODE ISLAND

Chemical		CAS #	RfDo[(1)] mg/kg/d	RfDo[(2)] mg/kg/d		CSFo[(1)] 1/mg/kg/d	CSFo[(2)] 1/mg/kg/d		RfDi[(1)] 1/mg/kg/d	RfDi[(2)] mg/kg/d		CSFi[(1)] 1/mg/kg/d	CSFi[(2)] 1/mg/kg/d	
ACETONE		67-64-1	**1.0E-01**	**9.0E-01**	I									
ALDRIN		309-00-2	3.0E-05	3.0E-05	I	1.7E+01	1.7E+01	I					**1.7E+01**	I
ALUMINUM		7429-90-5	1.0E+00	1.0E+00	P					**1.0E-03**	P			
ANTIMONY		7440-36-0	4.0E-04	4.0E-04	I									
ARSENIC		7440-38-2	3.0E-04	3.0E-04	I	1.8E+00	1.5E+00	I				1.5E+01	1.5E+01	I
BENZENE		71-43-2		**4.0E-03**	I	**2.9E-02**	**5.5E-02**	I		**8.6E-03**	I	2.9E-02	2.7E-02	I
BERYLLIUM		7440-41-7	**5.0E-03**	**2.0E-03**	I	4.3E+00			**5.0E-03**	**5.7E-06**	I	8.4E+00	8.4E+00	I
BIS(2-CHLOROETHYL)ETHER		111-44-4				1.1E+00	1.1E+00	I				1.1E+00	1.1E+00	I
BIS(2-CHLOROISOPROPYL)ETHER		108-60-1	4.0E-02	4.0E-02	I	7.0E-02	7.0E-02	H	4.0E-02			3.5E-02	3.5E-02	H
CADMIUM-WATER		7440-43-9	5.0E-04	5.0E-04	I				**5.0E-04**	**5.7E-05**	E	6.3E+00	6.3E+00	I
CADMIUM-FOOD		7440-43-9	1.0E-03	1.0E-03	I				**5.0E-04**	**5.7E-05**	E	6.3E+00	6.3E+00	I
CHLOROBENZENE		108-90-7	2.0E-02	2.0E-02	I	6.1E-03			5.7E-03	1.4E-02	P			
CHLOROFORM		67-66-3	1.0E-02	1.0E-02	I	6.1E-03			1.0E-02	1.4E-02	E	8.0E-02	8.1E-02	I
CHROMIUM VI		18540-29-9	5.0E-03	3.0E-03	I				**5.0E-03**	**3.0E-05**	I	4.2E+01	4.1E+01	I
COPPER		7440-50-8	3.7E-02	4.0E-02	H									
DDE		72-55-9				3.4E-01	3.4E-01	I				3.4E-01		
DIBENZOFURAN		132-64-9	**4.0E-03**	**1.0E-03**	P									
1,4-DICHLOROBENZENE		106-46-7		**3.0E-02**	E	2.4E-02	2.4E-02	H	2.3E-01	2.3E-01	I		**4.0E-02**	O
1,2-DICHLOROETHANE		107-06-2				9.1E-02	9.1E-02	I		**7.0E-01**	M	9.1E-02	9.1E-02	I
TOTAL 1,2-DICHLOROETHENE		540-59-0	9.0E-03	9.0E-03	H				9.0E-03					
1,2-DICHLOROPROPANE		78-87-5				6.8E-02	6.8E-02	H	1.1E-03	1.1E-03	I	6.8E-02	3.6E-02	O
ETHYLBENZENE		100-41-4	1.0E-01	1.0E-01	I				2.9E-01	2.9E-01	I			
MANGANESE-NONFOOD		7439-96-5	5.0E-03	2.0E-02	I				**5.0E-03**	**1.4E-05**	I			
MANGANESE-FOOD		7439-96-5	1.0E-03	1.4E-01	I				1.0E-03	1.4E-05	I			
MERCURIC CHLORIDE		7487-94-7	3.0E-04	3.0E-04	I				3.0E-04					
MERCURY (elemental)		7439-97-6							8.6E-05	8.6E-05	I			
METHYLMERCURY		22967-92-6	1.0E-04	1.0E-04	I									
METHYLENE CHLORIDE		75-09-2	6.0E-02	6.0E-02	I	7.5E-03	7.5E-03	I	**8.6E-01**	**3.0E-01**	M	1.6E-03	1.7E-03	I
2-METHYLPHENOL		95-48-7	5.0E-02	5.0E-02	I									
4-METHYLPHENOL		106-44-5	5.0E-03	5.0E-03	H				5.0E-03					
POLYCHLORINATED BIPHENYLS		1336-36-3				7.7E+00	2.0E+00	I					**2.0E+00**	I
AROCLOR-1254		11097-69-1	2.0E-05	2.0E-05	I	7.7E+00	2.0E+00	I					**2.0E+00**	I
ACENAPHTHENE		83-32-9	6.0E-02	6.0E-02	I									
ANTHRACENE		120-12-7	3.0E-01	3.0E-01	I									

TABLE G-3

COMPARISON OF CANCER SLOPE FACTORS (CSF) AND NONCARCINOGNENIC REFERENCE DOSES (RfDS) USED IN THE SITE 07 AND 09 RISK ASSESSMENTS WITH CURRENT VALUES FORMER NCBC DAVISVILLE NORTH KINGSTOWN, RHODE ISLAND

Chemical		CAS #	RfDo(1) mg/kg/d	RfDo(2) mg/kg/d		CSFo(1) 1/mg/kg/d	CSFo(2) 1/mg/kg/d		RfDi(1) 1/mg/kg/d	RfDi(2) mg/kg/d		CSFi(1) 1/mg/kg/d	CSFi(2) 1/mg/kg/d	
BENZ[A]ANTHRACENE	m(3)	56-55-3				7.3E-01	7.3E-01	P						
BENZO[B]FLUORANTHENE	m	205-99-2				7.3E-01	7.3E-01	E						
BENZO[K]FLUORANTHENE	m	207-08-9				7.3E-02	7.3E-02	E						
BENZO[A]PYRENE	m	50-32-8				7.3E+00	7.3E+00	I					**3.1E+00**	E
CARBAZOLE		86-74-8				2.0E-02	2.0E-02	H						
CHRYSENE	m	218-01-9				7.3E-03	7.3E-03	E						
DIBENZ[A,H]ANTHRACENE	m	53-70-3				7.3E+00	7.3E+00	E						
FLUORANTHENE		206-44-0	4.0E-02	4.0E-02	I				4.0E-02					
FLUORENE		86-73-7	4.0E-02	4.0E-02	I				4.0E-02					
INDENO[1,2,3-C,D]PYRENE	m	193-39-5				7.3E-01	7.3E-01	E						
NAPHTHALENE		91-20-3	**4.0E-02**	**2.0E-02**	I				**4.0E-02**	**9.0E-04**	I			
PYRENE		129-00-0	3.0E-02	3.0E-02	I									
2,3,7,8-TETRACHLORODIBENZODIOXIN		1746-01-6				1.5E+05	1.5E+05	H				1.5E+05	1.5E+05	H
1,1,2,2-TETRACHLOROETHANE		79-34-5				2.0E-01	2.0E-01	I					**2.0E-01**	I
THALLIUM		7440-28-0	8.0E-05	7.0E-05	O									
TOLUENE		108-88-3	**2.0E-01**	**8.0E-02**	I				1.1E-01	1.4E+00	I			
1,1,2-TRICHLOROETHANE		79-00-5	4.0E-03	4.0E-03	I	5.7E-02	5.7E-02	I					5.6E-02	I
TRICHLOROETHENE		79-01-6	**6.0E-03**	**3.0E-04**	E	**1.1E-02**	**4.0E-01**	E	6.0E-03	1.0E-02	E	**6.0E-03**	**4.0E-01**	E
VINYL CHLORIDE inc earlylife		75-01-4		**3.0E-03**	I	1.9E+00	1.4E+00	I		**2.8E-02**	I	3.0E-01	3.0E-02	I
VINYL CHLORIDE: adult		75-01-4		**3.0E-03**	I	1.9E+00	7.2E-01	I		**2.8E-02**	I	3.0E-01	1.5E-02	I
ZINC		7440-66-6	3.0E-01	3.0E-01	I									

NOTES:

1. Value used in Site 07 and Site 09 risk assessments.
2. Current values (Sources - IRIS, Region 3 RBC Table, October 2007)
3. m = chemical that acts by a mutagenic mode of action.
4. Noteworthy differences are bolded (i.e., the current RfD or CSF is a factor of 2 (or more) more conservative than historical values.)

I = EPA's Integrated Risk Information System.

H = EPA's Heast Assessment Summary Tables.

E = EPA National Center for Environmental Assessment provisional value.

P = EPA provisional peer review toxicity value.

O = Other reference source.

M = Agency for Toxic Substances and Disease Registry (ASTDR) Minimal Risk Level (MRL) (chronic).

TABLE G-4

COMPARISON OF EXPOSURE FACTORS USED IN THE SITE 07 AND SITE 09 RISK ASSESSMENTS WITH CURRENTLY USED VALUES

GLOBAL VARIABLES	Values used in Site 07 and 09 Risk Assessments	Current Values	
Body Weight			
Construction and Residential	70	No Change	
Recreation (youth)	36	No Change	
Shellfishing	59	No Change	
Exposure Duration			
Construction	1	No Change	
Recreation (youth)	16	No Change	
Shellfishing and Residential	30	No Change	
Averaging Times			
Cancer	25550	No Change	
Noncancer			
Construction	365	No Change	
Recreation (youth)	5840	No Change	
Shellfishing and Residential	10950	No Change	
Relative Absorption Factors			
Ingestion of Soil and Shellfish			
VOCs	1	No Change	
PAHs	1	No Change	
PCBs	0.3	1	
Pesticides	0.3 to 1	1	
Inorganics	1	No Change	
Lead	0.3 or 0.5	1	
Dermal Contact with Soil			
VOCs	0.5	negligible	USEPA 2004
PAHs	0.05	0.13	USEPA 2004
PCBs	0.05	0.14	USEPA 2004
Pesticides	0.05 or 0.5	0.03 - 0.04	USEPA 2004
Inorganics	negligible	negligible	USEPA 2004
Inhalation of Dust and Volatiles	1	No Change	
Ingestion of Groundwater	1	No Change	
Adherence Factor for Soil	0.5	Child - 0.2	USEPA 2004
		Adult - 0.07	USEPA 2004
		Worker - 0.3	USEPA, 2002

FUTURE CONSTRUCTION SCENARIO			
Exposure Time (hrs/day)	8	No Change	
Exposure Frequency (day/yr)	85	No Change	
Soil Ingestion Rate (mg/day)	480	330	USEPA, 2002
Skin Surface Area (cm^2)	3780	3300	USEPA, 2002
Incidental Ingestion of Groundwater (L/day)	0.05	No Change	

TABLE G-4

COMPARISON OF EXPOSURE FACTORS USED IN THE SITE 07 AND SITE 09 RISK ASSESSMENTS WITH CURRENTLY USED VALUES

FUTURE RECREATION SCENARIO			
Exposure Time (hrs/day)			
Showering	0.2	0.58	USEPA 2004
Swimming	1	No Change	
Exposure Frequency (day/yr)			
Showering and Swimming	39	No Change	
Non-swimming Related Pathways	144	No Change	
Ingestion Rate of Soil (mg/day)	126	No Change	
Skin Surface Area for Soil (cm^2)	925	2230	USEPA, 2004, Exhibit C-1
Incidental Ingestion of Sediment (mg/day)	63	No Change	
Skin Surface Area for Sediment (cm^2)	463	1260	USEPA, 2004, Exhibit C-1
Skin Surface Area for Showering (cm^2)	14600	11600	USEPA, 2004, Exhibit C-1
Incidental Ingestion of Surface Water (L/day)	0.05	No Change	
Skin Surface Area while Swimming (cm^2)			
Adult	23000	18000	USEPA, 2002
Child	10600	6600	USEPA, 2002

CONSUMPTION OF LOCALLY-CAUGHT SHELLFISH		
Exposure Frequency (day/yr)	350	No Change
Ingestion Rate (g/day)	55	No Change
Fraction of Ingested Shellfish Caught Locally	1	No Change

HYPOTHETICAL RESIDENTIAL CONSUMPTION OF GROUNDWATER		
Exposure Frequency (day/yr)	350	No Change
Ingestion Rate (L/day)	2	No Change

References:
USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, December.

USEPA, 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part E, (Supplemental Guidance for Dermal Risk Assessment), Final, July.

1: It should be noted that many of the exposure assumptions utilized to prepare the original risk assessments for Site 07 and Site 09 are based on professional judgment and are not a function of "old" versus "new" guidance. Please also note the exposure assumptions presented in the 2007 Site 07 shoreline risk assessment. These exposure factor values represent the most current values for the evaluation of a recreational receptor exposed to surface waters and sediments along a shoreline.

TABLE G-5

COMPARISON OF SCREENING CONCENTRATIONS BASED ON 1995 REGION 3 RBCS, 2004 REGION 9 PRGS, AND 2007 REGION 3 RBCS FOR INDUSTRIAL SOIL SITE 07 - SURFACE AND SUBSURFACE SOIL

Chemical	CAS #	Maximum Soil Concentration[1]	1995 RBC for Industrial Soil[2]		2004 PRG for Industrial Soil[3]		2007 RBC for Industrial Soil[4]	
		(mg/kg)	(mg/kg)		(mg/kg)		(mg/kg)	
ACETONE	67-64-1	6.1	20000	N	5400	nc	92000	N
ALUMINUM	7429-90-5	7720	100000	N	100000	max	100000	N
ANTIMONY	7440-36-0	3.9	82	N	41	nc	41	N
ARSENIC	7440-38-2	2.2	3.3	C	1.6	ca	1.9	C
BARIUM	7440-39-3	18.6	14000	N	100000	max	20000	N
BERYLLIUM	7440-41-7	0.49	1.3	C	190	nc	200	N
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	0.38	410	C	120	ca	200	C
CADMIUM	7440-43-9	4.7	100	N	45	nc	51	N
CHLOROFORM	67-66-3	0.001	940	C	0.47	ca	1000	N
CHROMIUM VI	18540-29-9	13.1	1000	N	64	ca	310	N
COBALT	7440-48-4	6.1	12000	N	1900	ca*	NA	
COPPER	7440-50-8	14.6	8200	N	4100	nc	4100	N
CYANIDE (FREE)	57-12-5	0.16	4100	N	1200	nc	2000	N
DDE	72-55-9	0.019	17	C	7	ca	8.4	C
DDT	50-29-3	0.022	17	C	7	ca*	8.4	C
IRON	7439-89-6	15600	NA		NA		NA	
MANGANESE-NONFOOD	7439-96-5	137	1000	N	1900	nc	2000	N
NICKEL	7440-02-0	243	4100	N	2000	nc	2000	N
SELENIUM	7782-49-2	0.32	1000	N	510	nc	510	N
1,1,2,2-TETRACHLOROETHANE	79-34-5	0.015	29	C	0.93	ca	14	C
THALLIUM	7440-28-0	0.87	16	N	6.7	nc	7.2	N
TOLUENE	108-88-3	0.003	41000	N	520	sat	8200	N
1,1,1-TRICHLOROETHANE	71-55-6	0.006	18000	N	1200	sat	200000	N
TRICHLOROETHENE	79-01-6	0.018	520	C	6.5	ca	7.2	C
VANADIUM	7440-62-2	14.3	1400	N	100	nc	100	N
ZINC	7440-66-6	33.6	61000	N	100000	max	31000	N

NOTES:

Shaded values indicate that the maximum soil concentration is greater than the specified RBC or PRG.

1. Maximum detected concentration in surface and subsurface soil from 1 to 10 feet bgs.
2. USEPA Region 3 RBC Tables, 1995 (screening values for noncarcinogens are based on a Hazard Index of 0.1).
3. USEPA Region 9 PRG Tables, October 2004, updated December 2007 (screening values for noncarcinogens are based on a Hazard Index of 0.1).
4. USEPA Region 3 RBC Tables, October 2007 (screening values for noncarcinogens are based on a Hazard Index of 0.1).

TABLE G-6

COMPARISON OF SCREENING CONCENTRATIONS BASED ON 1995 REGION 3 RBCS, 2004 REGION 9 PRGS, AND 2007 REGION 3 RBCS FOR INDUSTRIAL SOIL SITE 07 - SEDIMENT

Chemical	CAS #	*Maximum Sediment* Concentration (mg/kg)	1995 RBC for Industrial Soil[1] (mg/kg)		2004 PRG for Industrial Soil[2] (mg/kg)		2007 RBC for Industrial Soil[3] (mg/kg)	
ALUMINUM	7429-90-5	14400	100000	N	100000	max	100000	N
ARSENIC	7440-38-2	22.1	3.3	C	1.6	ca	1.9	C
BARIUM	7440-39-3	125	14000	N	100000	max	20000	N
BERYLLIUM	7440-41-7	0.4	1.3	C	190	nc	200	N
CADMIUM-FOOD	7440-43-9	3.9	100	N	45	nc	51	N
CHLORDANE	57-74-9	0.00053	4.4	C	6.5	ca	8.2	C
CHROMIUM VI	18540-29-9	40.2	1000	N	64	ca	310	N
COBALT	7440-48-4	83.3	12000	N	1300	nc	NA	
COPPER	7440-50-8	50.4	8200	N	4100	nc	4100	N
DDD	72-54-8	0.003	24	C	10	ca	12	C
DDE	72-55-9	0.011	17	C	7	ca	8.4	C
ENDRIN	72-20-8	0.00078	61	N	18	nc	31	N
BETA-HCH	319-85-7	0.0017	3.2	C	1.3	ca	1.6	C
IRON	7439-89-6	70200	NA		NA		NA	
MANGANESE	7439-96-5	730	1000	N	1900	nc	2000	N
METHYL ETHYL KETONE	78-93-3	0.16	100000	N	11000	nc	61000	N
NICKEL	7440-02-0	121	4100	N	2000	nc	2000	N
AROCLOR-1260	11096-82-5	0.06	0.74	C	0.74	ca	1.4	C
BENZ[A]ANTHRACENE	56-55-3	0.0342	7.8	C	2.1	ca	3.9	C
BENZO[B]FLUORANTHENE	205-99-2	0.0556	7.8	C	2.1	ca	3.9	C
BENZO[K]FLUORANTHENE	207-08-9	0.054	78	C	21	ca	39	C
BENZO[A]PYRENE	50-32-8	0.0342	0.78	C	0.21	ca	0.39	C
CHRYSENE	218-01-9	0.0386	780	C	210	ca	390	C
DIBENZ[A,H]ANTHRACENE	53-70-3	0.00559	0.78	C	0.21	ca	0.39	C
FLUORANTHENE	206-44-0	0.0775	8200	N	2200	nc	4100	N
FLUORENE	86-73-7	0.00243	8200	N	2600	nc	4100	N
INDENO[1,2,3-C,D]PYRENE	193-39-5	0.0219	7.8	C	2.1	ca	3.9	C
NAPHTHALENE	91-20-3	0.00395	8200	N	19	nc	2000	N
PYRENE	129-00-0	0.0721	6100	N	2900	nc	3100	N
SILVER	7440-22-4	1.1	1000	N	510	nc	510	N
THALLIUM	7440-28-0	5.5	16	N	6.7	nc	7.2	N
VANADIUM	7440-62-2	27.4	1400	N	100	nc	100	N
ZINC	7440-66-6	591	61000	N	100000	max	31000	N

NOTES:

Shaded values indicate that the maximum sediment concentration is greater than the specified RBC or PRG.

1. USEPA Region 3 RBC Tables, 1995 (screening values for noncarcinogens are based on a Hazard Index of 0.1).
2. USEPA Region 9 PRG Tables, October 2004, updated December 2007 (screening values for noncarcinogens are based on a Hazard Index of 0.1).
3. USEPA Region 3 RBC Tables, October 2007 (screening values for noncarcinogens are based on a Hazard Index of 0.1).

TABLE G-7

COMPARISON OF SCREENING CONCENTRATIONS BASED ON
1995 REGION 3 RBCS, 2004 REGION 9 PRGS, AND 2007 REGION 3 RBCS FOR TAP WATER
SITE 07 - GROUNDWATER

Chemical	CAS #	Maximum GW Conc[1]	1995 RBC for Tap Water[2]		2004 PRG for Tap Water[3]		2007 RBC for Tap Water[4]	
		(ug/L)	(ug/L)		(ug/L)		(ug/L)	
ACETONE	67-64-1	1800	370	N	550	nc	550	N
ALUMINUM	7429-90-5	129000	3700	N	3600	nc	3700	N
ARSENIC	7440-38-2	63.5	0.045	C	0.045	ca	0.045	C
BARIUM	7440-39-3	253	260	N	730	nc	730	N
BENZENE	71-43-2	550	0.36	C	0.35	ca	0.34	C
BERYLLIUM	7440-41-7	6.4	0.016	C	7.3	nc	7.3	N
BROMODICHLOROMETHANE	75-27-4	78	0.17	C	0.18	ca	0.17	C
CARBON DISULFIDE	75-15-0	4	100	N	100	nc	100	N
CHLOROBENZENE	108-90-7	100	3.9	N	9	nc	9	N
CHLOROFORM	67-66-3	24	0.15	C	0.17	ca	0.15	C
CHLOROMETHANE	74-87-3	98	1.4	C	16	nc	19	N
CHROMIUM VI	18540-29-9	292	18	N	11	nc	11	N
COBALT	7440-48-4	151	220	N	73	nc	NA	
COPPER	7440-50-8	268	150	N	150	nc	150	N
1,1-DICHLOROETHANE	75-34-3	74	81	N	91	nc	90	N
1,2-DICHLOROETHANE	107-06-2	120	0.12	C	0.12	ca*	0.12	C
1,1-DICHLOROETHENE	75-35-4	16	0.044	C	34	nc	35	N
TOTAL 1,2-DICHLOROETHENE	540-59-0	5700	5.5	N	NA		5.5	N
1,2-DICHLOROPROPANE	78-87-5	98	0.16	C	0.27	ca	0.26	C
1,3-DICHLOROPROPENE	542-75-6	66	0.077	C	0.4	ca	0.26	C
IRON	7439-89-6	295000	NA		NA		NA	
MANGANESE	7439-96-5	15500	18	N	88	nc	73	N
MERCURY (AS MERCURIC CHLORIDE)	7487-94-7	0.15	1.1	N	1.1	nc	1.1	N
METHYL ETHYL KETONE	78-93-3	34	190	N	700	nc	700	N
NICKEL	7440-02-0	320	73	N	73	nc	73	N
SELENIUM	7782-49-2	5.3	18	N	18	nc	18	N
STYRENE	100-42-5	72	160	N	160	nc	160	N
1,1,2,2-TETRACHLOROETHANE	79-34-5	77000	0.052	C	0.055	ca	0.053	C
TETRACHLOROETHENE	127-18-4	1000	1.1	C	0.1	ca	0.1	C
THALLIUM	7440-28-0	31.6	0.29	N	0.24	nc	0.26	N
TOLUENE	108-88-3	96	75	N	230	nc	230	N
1,1,2-TRICHLOROETHANE	79-00-5	1200	0.19	C	0.2	ca	0.19	C
TRICHLOROETHENE	79-01-6	120000	1.6	C	1.4	ca	0.026	C
VANADIUM	7440-62-2	224	26	N	3.6	nc	3.7	N
VINYL CHLORIDE	75-01-4	31	0.019	C	0.02	ca	0.015	C
XYLENES	1330-20-7	220	1200	N	21	nc	21	N
ZINC	7440-66-6	626	1100	N	1100	nc	1100	N

NOTES:

Shaded values indicate that the maximum groundwater concentration is greater than the specified RBC or PRG.

1. Maximum of deep and shallow groundwater samples.
2. USEPA Region 3 RBC Tables, 1995 (screening values for noncarcinogens are based on a Hazard Index of 0.1).
3. USEPA Region 9 PRG Tables, October 2004, updated December 2007 (screening values for noncarcinogens are based on a Hazard Index of 0.1).
4. USEPA Region 3 RBC Tables, October 2007 (screening values for noncarcinogens are based on a Hazard Index of 0.1).

TABLE G-8

COMPARISON OF SCREENING CONCENTRATIONS BASED ON 1995 REGION 3 RBCS, 2004 REGION 9 PRGS, AND 2007 REGION 3 RBCS FOR FISH TISSUE
SITE 07 - FISH

Chemical	CAS #	Maximum Fish Concentration (mg/kg)	1995 RBC for Fish[1] (mg/kg)		2007 RBC for Fish[2] (mg/kg)	
ALDRIN	309-00-2	0.000244	0.00019	C	0.00019	C
ALUMINUM	7429-90-5	0.0314	140	N	140	N
ARSENIC	7440-38-2	2.5	0.018	C	0.0021	C
CADMIUM-FOOD	7440-43-9	2.39	0.068	N	0.068	N
CHLORDANE	57-74-9	0.00054	0.0024	C	0.009	C
CHROMIUM VI	18540-29-9	0.704	0.68	N	0.41	N
COPPER	7440-50-8	126	5.4	N	5.4	N
DDD	72-54-8	0.00697	0.013	C	0.013	C
DDE	72-55-9	0.0228	0.0093	C	0.0093	C
DDT	50-29-3	0.00025	0.0093	C	0.0093	C
HEXACHLOROBENZENE	118-74-1	0.00101	0.002	C	0.002	C
ALPHA-HCH	319-84-6	7.00E-05	0.0005	C	0.0005	C
GAMMA-HCH (LINDANE)	58-89-9	0.00004	0.0024	C	0.0024	C
IRON	7439-89-6	800	NA		NA	
MANGANESE	7439-96-5	21.6	19	N	2.7	N
METHYLMERCURY	22967-92-6	49.1	0.014	N	0.014	N
MIREX	2385-85-5	0.0000928	0.0018	C	0.027	N
NICKEL	7440-02-0	5	2.7	N	2.7	N
AROCLOR-1242	53469-21-9	0.022	0.000041	C	0.0016	C
AROCLOR-1254	11097-69-1	0.1335	0.000041	C	0.0016	C
AROCLOR-1260	11096-82-5	0.0849	0.000041	C	0.0016	C
ACENAPHTHENE	83-32-9	0.00846	8.1	N	8.1	N
ANTHRACENE	120-12-7	0.00625	41	N	41	N
BENZ[A]ANTHRACENE	56-55-3	0.003	0.0043	C	0.0043	C
BENZO[B]FLUORANTHENE	205-99-2	0.0358	0.0043	C	0.0043	C
BENZO[K]FLUORANTHENE	207-08-9	0.00596	0.043	C	0.043	C
BENZO[A]PYRENE	50-32-8	0.00606	0.00043	C	0.00043	C
CHRYSENE	218-01-9	0.0893	0.43	C	0.43	C
DIBENZ[A,H]ANTHRACENE	53-70-3	0.00128	0.00043	C	0.00043	C
FLUORANTHENE	206-44-0	0.216	5.4	N	5.4	N
FLUORENE	86-73-7	0.0107	5.4	N	5.4	N
INDENO[1,2,3-C,D]PYRENE	193-39-5	0.00416	0.0043	C	0.0043	C
PYRENE	129-00-0	0.0979	4.1	N	4.1	N
SILVER	7440-22-4	6.2	0.68	N	0.68	N
ZINC	7440-66-6	4730	41	N	41	N

NOTES:

Shaded values indicate that the maximum concentration is greater than the specified RBC or PRG.

1. USEPA Region 3 RBC Tables, 1995 (screening values for noncarcinogens are based on a Hazard index of 0.1).
2. USEPA Region 3 RBC Tables, October 2007 (screening values for noncarcinogens are based on a Hazard index of 0.1).

TABLE G-9

COMPARISON OF SCREENING CONCENTRATIONS BASED ON 1995 REGION 3 RBCS, 2004 REGION 9 PRGS, AND 2007 REGION 3 RBCS FOR INDUSTRIAL SOIL SITE 09 - SURFACE AND SUBSURFACE SOIL

Chemical	CAS #	Maximum Soil Concentration[1]	1995 RBC for Industrial Soil[2]		2004 PRG for Industrial Soil[3]		2007 RBC for Industrial Soil[4]	
		(mg/kg)	(mg/kg)		(mg/kg)		(mg/kg)	
ACETONE	67-64-1	59	20000	N	5400	nc	92000	N
ALDRIN	309-00-2	0.026	0.34	C	0.1	ca	0.17	C
ALUMINUM	7429-90-5	37900	100000	N	100000	max	100000	N
ANTIMONY	7440-36-0	89.2	82	N	41	nc	41	N
ARSENIC	7440-38-2	28.3	3.3	C	1.6	ca	1.9	C
BARIUM	7440-39-3	1190	14000	N	100000	max	20000	N
BENZENE	71-43-2	1.5	200	C	1.4	ca*	52	C
BENZOIC ACID	65-85-0	0.87	100000	N	100000	max	410000	N
BERYLLIUM	7440-41-7	75.4	1.3	C	1900	ca**	200	N
BIS(2-CHLOROETHYL)ETHER	111-44-4	0.065	5.2	C	0.58	ca	2.6	C
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	33	410	C	120	ca	200	C
BUTYLBENZYLPHTHALATE	85-68-7	13	41000	N	100000	max	20000	N
CADMIUM	7440-43-9	172	100	N	45	nc	51	N
CHLOROBENZENE	108-90-7	0.19	4100	N	44	nc	2000	N
CHLOROFORM	67-66-3	0.002	940	C	0.47	ca	1000	N
CHROMIUM VI	18540-29-9	955	1000	N	64	ca	310	N
COBALT	7440-48-4	431	12000	N	1300	nc	NA	
COPPER	7440-50-8	24700	8200	N	4100	nc	4100	N
CYANIDE (FREE)	57-12-5	1.1	4100	N	1200	nc	2000	N
DDD	72-54-8	0.62	24	C	10	ca	12	C
DDE	72-55-9	0.89	17	C	7	ca	8.4	C
DDT	50-29-3	0.019	17	C	7	ca*	8.4	C
DIBENZOFURAN	132-64-9	120	820	N	78	nc	100	N
DIBUTYLPHTHALATE	84-74-2	5.7	20000	N	6200	nc	10000	N
1,2-DICHLOROBENZENE	95-50-1	4.3	18000	N	600	sat	9200	N
1,3-DICHLOROBENZENE	541-73-1	0.062	18000	N	600	sat	310	N
1,4-DICHLOROBENZENE	106-46-7	0.84	240	C	4.5	ca	120	C
TOTAL 1,2-DICHLOROETHENE	540-59-0	3.1	1800	N	NA		920	N
DIELDRIN	60-57-1	0.054	0.36	C	0.11	ca	0.18	C
DIETHYLPHTHALATE	84-66-2	4.3	100000	N	100000	max	82000	N
2,4-DIMETHYLPHENOL	105-67-9	4.8	4100	N	1200	nc	2000	N
ENDOSULFAN	115-29-7	0.013	1200	N	370	nc	610	N
ENDRIN	72-20-8	0.097	61	N	18	nc	31	N
ETHYLBENZENE	100-41-4	910	20000	N	740	nc	10000	N
HEPTACHLOR	76-44-8	0.015	1.3	C	0.38	ca	0.64	C
HEPTACHLOR EPOXIDE	1024-57-3	0.029	0.63	C	0.19	ca*	0.31	C
ALPHA-HCH	319-84-6	9.80E-04	0.91	C	0.36	ca	0.45	C
BETA-HCH	319-85-7	0.042	3.2	C	1.3	ca	1.6	C
GAMMA-HCH (LINDANE)	58-89-9	0.014	4.4	C	1.7	ca	2.2	C
IRON	7439-89-6	303000	NA		NA		NA	
MANGANESE-NONFOOD	7439-96-5	2920	1000	N	1900	nc	2000	N
MERCURY (AS MERCURIC CHLORIDE)	7487-94-7	191	61	N	31	nc	31	N

TABLE G-9

COMPARISON OF SCREENING CONCENTRATIONS BASED ON 1995 REGION 3 RBCS, 2004 REGION 9 PRGS, AND 2007 REGION 3 RBCS FOR INDUSTRIAL SOIL SITE 09 - SURFACE AND SUBSURFACE SOIL

Chemical	CAS #	Maximum Soil Concentration[1]	1995 RBC for Industrial Soil[2]		2004 PRG for Industrial Soil[3]		2007 RBC for Industrial Soil[4]	
		(mg/kg)	(mg/kg)		(mg/kg)		(mg/kg)	
METHOXYCHLOR	72-43-5	0.63	1000	N	310	nc	510	N
METHYLENE CHLORIDE	75-09-2	56	760	C	21	ca	380	C
METHYL ETHYL KETONE	78-93-3	180	100000	N	11000	nc	61000	N
2-METHYLPHENOL	95-48-7	0.058	10000	N	3100	nc	5100	N
NICKEL	7440-02-0	4210	4100	N	2000	nc	2000	N
N-NITROSODIPHENYLAMINE	86-30-6	0.12	1200	C	350	ca*	580	C
PENTACHLOROPHENOL	87-86-5	0.098	48	C	9	ca	24	C
PHENOL	108-95-2	77	100000	N	100000	max	31000	N
AROCLOR-1254	11097-69-1	3.4	0.74	N	0.74	ca*	1.4	C
AROCLOR-1260	11096-82-5	30	0.74	C	0.74	ca	1.4	C
ACENAPHTHENE	83-32-9	150	12000	N	2900	nc	6100	N
ANTHRACENE	120-12-7	340	61000	N	100000	max	31000	N
BENZ[A]ANTHRACENE	56-55-3	420	7.8	C	2.1	ca	3.9	C
BENZO[B]FLUORANTHENE	205-99-2	490	7.8	C	2.1	ca	3.9	C
BENZO[K]FLUORANTHENE	207-08-9	490	78	C	21	ca	39	C
BENZO[A]PYRENE	50-32-8	150	0.78	C	0.21	ca	0.39	C
CARBAZOLE	86-74-8	160	290	C	86	ca	140	C
CHRYSENE	218-01-9	320	780	C	210	ca	390	C
DIBENZ[A,H]ANTHRACENE	53-70-3	29	0.78	C	0.21	ca	0.39	C
FLUORANTHENE	206-44-0	1000	8200	N	2200	nc	4100	N
FLUORENE	86-73-7	270	8200	N	2600	nc	4100	N
INDENO[1,2,3-C,D]PYRENE	193-39-5	79	7.8	C	2.1	ca	3.9	C
2-METHYLNAPHTHALENE	91-57-6	78	8200	N	NA		410	N
NAPHTHALENE	91-20-3	260	8200	N	19	nc	2000	N
PYRENE	129-00-0	660	6100	N	2900	nc	3100	N
SELENIUM	7782-49-2	3.2	1000	N	510	nc	510	N
SILVER	7440-22-4	34.9	1000	N	510	nc	510	N
2,3,7,8-TETRACHLORODIBENZODIOXIN	1746-01-6	0.00022	0.00004	C	0.000016	ca	0.000019	C
TETRACHLOROETHENE	127-18-4	0.012	110	C	1.3	ca	5.3	C
THALLIUM	7440-28-0	0.69	16	N	6.7	nc	7.2	N
TOLUENE	108-88-3	15400	41000	N	520	sat	8200	N
1,2,4-TRICHLOROBENZENE	120-82-1	0.24	2000	N	22	nc	1000	N
1,1,1-TRICHLOROETHANE	71-55-6	0.013	18000	N	1200	sat	200000	N
TRICHLOROETHENE	79-01-6	3.8	520	C	6.5	ca	7.2	C
VANADIUM	7440-62-2	823	1400	N	100	nc	100	N
ZINC	7440-66-6	34300	61000	N	100000	max	31000	N

NOTES:

Shaded values indicate that the maximum soil concentration is greater than the specified RBC or PRG.

1. Maximum detected concentration in surface and subsurface soil from 1 to 10 feet bgs.
2. USEPA Region 3 RBC Tables, 1995 (screening values for noncarcinogens are based on a Hazard Index of 0.1).
3. USEPA Region 9 PRG Tables, October 2004, updated December 2007 (screening values for noncarcinogens are based on a Hazard Index of 0.1).
4. USEPA Region 3 RBC Tables, October 2007 (screening values for noncarcinogens are based on a Hazard Index of 0.1).

TABLE G-10

COMPARISON OF SCREENING CONCENTRATIONS BASED ON 1995 REGION 3 RBCS, 2004 REGION 9 PRGS, AND 2007 REGION 3 RBCS FOR INDUSTRIAL SOIL SITE 09 - SEDIMENT

Chemical	*CAS #*	Maximum Sediment Concentration (mg/kg)	*1995 RBC for Industrial Soil*[1] (mg/kg)		*2004 PRG for Industrial Soil*[2] (mg/kg)		*2007 RBC for Industrial Soil*[3] (mg/kg)	
ACETONE	67-64-1	0.37	20000	N	5400	nc	92000	N
ALUMINUM	7429-90-5	10500	100000	N	100000	max	100000	N
ANTIMONY	7440-36-0	65.3	82	N	41	nc	41	N
ARSENIC	7440-38-2	32.5	3.3	C	1.6	ca	1.9	C
BARIUM	7440-39-3	221	14000	N	100000	max	20000	N
BENZENE	71-43-2	0.0072	200	C	1.4	ca*	52	C
BENZOIC ACID	65-85-0	0.21	100000	N	100000	max	410000	N
BERYLLIUM	7440-41-7	2.2	1.3	C	190	nc	200	N
BROMODICHLOROMETHANE	*75-27-4*	*0.0072*	*92*	*C*	*1.8*	*ca*	*46*	*C*
BROMOFORM	75-25-2	0.0072	720	C	220	ca*	360	C
BROMOMETHANE	74-83-9	0.0072	290	N	1.3	nc	140	N
BUTYLBENZYLPHTHALATE	85-68-7	0.6	41000	N	100000	max	20000	N
CADMIUM	7440-43-9	11.2	100	N	45	nc	51	N
CARBON DISULFIDE	75-15-0	0.034	20000	N	720	sat	10000	N
CARBON TETRACHLORIDE	*56-23-5*	*0.0072*	*44*	*C*	*0.55*	*ca**	*22*	*C*
CHLORDANE	57-74-9	0.001	4.4	C	6.5	ca	8.2	C
CHLOROBENZENE	108-90-7	0.673	4100	N	44	nc	2000	N
CHLOROETHANE	75-00-3	0.0072	82000	C	6.5	ca	990	C
CHLOROFORM	67-66-3	0.0072	940	C	0.47	ca	1000	N
CHROMIUM VI	18540-29-9	560	1000	N	64	ca	310	N
COBALT	7440-48-4	59.8	12000	N	13000	ca*	NA	NA
COPPER	7440-50-8	1730	8200	N	4100	nc	4100	N
DDD	72-54-8	0.032	24	C	10	ca	12	C
DDE	72-55-9	0.0038	17	C	7	ca	8.4	C
DDT	50-29-3	3.40E-04	17	C	7	ca*	8.4	C
DIBENZOFURAN	132-64-9	0.84	820	N	78	nc	100	N
1,1-DICHLOROETHANE	75-34-3	0.0072	20000	N	180	nc	20000	N
1,2-DICHLOROETHANE	107-06-2	0.0072	63	C	0.6	ca*	31	C
1,1-DICHLOROETHENE	75-35-4	0.0072	9.5	C	41	nc	5100	N
CIS-1,2-DICHLOROETHENE	156-59-2	0.0072	33	N	15	nc	1000	N
TRANS-1,2-DICHLOROETHENE	156-60-5	0.0072	33	N	20	nc	2000	N
DIELDRIN	60-57-1	0.0029	0.36	C	0.11	ca	0.18	C
ENDOSULFAN	115-29-7	0.003	1200	N	370	nc	610	N
ENDRIN	72-20-8	0.0094	61	N	18	nc	31	N
ETHYLBENZENE	100-41-4	0.0072	20000	N	740	nc	10000	N
HEPTACHLOR EPOXIDE	1024-57-3	0.0081	0.63	C	0.19	ca*	0.31	C
IRON	7439-89-6	369000	NA	N	NA		NA	
MANGANESE-NONFOOD	7439-96-5	1160	10000		1900	nc	2000	N
MERCURY (AS MERCURIC CHLORIDE)	7487-94-7	1.4	61	N	31	nc	31	N
METHYLENE CHLORIDE	75-09-2	0.19	760	C	21	ca	380	C
METHYL ETHYL KETONE	78-93-3	0.0144	100000	N	11000	nc	61000	N
METHYL ISOBUTYL KETONE	108-10-1	0.0072	16000	N	4700	nc	NA	

TABLE G-10

COMPARISON OF SCREENING CONCENTRATIONS BASED ON 1995 REGION 3 RBCS, 2004 REGION 9 PRGS, AND 2007 REGION 3 RBCS FOR INDUSTRIAL SOIL SITE 09 - SEDIMENT

Chemical	CAS #	Maximum Sediment Concentration (mg/kg)	1995 RBC for Industrial Soil[1] (mg/kg)		2004 PRG for Industrial Soil[2] (mg/kg)		2007 RBC for Industrial Soil[3] (mg/kg)	
NICKEL	7440-02-0	148	4100	N	2000	nc	2000	N
PHENOL	108-95-2	1.2	100000	N	100000	max	31000	N
AROCLOR-1260	11096-82-5	0.25	0.74	C	0.74	C	1.4	C
ACENAPHTHENE	83-32-9	1.4	12000	N	2900	nc	6100	N
ANTHRACENE	120-12-7	2.2	61000	N	100000	max	31000	N
BENZ[A]ANTHRACENE	56-55-3	7.2	7.8	C	2.1	ca	3.9	C
BENZO[B]FLUORANTHENE	205-99-2	8.6	7.8	C	2.1	ca	3.9	C
BENZO[K]FLUORANTHENE	207-08-9	8.6	78	C	21	ca	39	C
BENZO[A]PYRENE	50-32-8	4.3	0.78	C	0.21	ca	0.39	C
CARBAZOLE	86-74-8	1.9	290	C	86	ca	140	C
CHRYSENE	218-01-9	5.4	780	C	210	ca	390	C
DIBENZ[A,H]ANTHRACENE	53-70-3	0.99	0.78	C	0.21	ca	0.39	C
FLUORANTHENE	206-44-0	11	8200	N	2200	nc	4100	N
FLUORENE	86-73-7	1.7	8200	N	2600	nc	4100	N
INDENO[1,2,3-C,D]PYRENE	193-39-5	3.1	7.8	C	2.1	ca	3.9	C
2-METHYLNAPHTHALENE	91-57-6	0.23	8200	N	NA		410	N
NAPHTHALENE	91-20-3	0.53	8200	N	19	nc	2000	N
PYRENE	129-00-0	9.2	6100	N	2900	nc	3100	N
SELENIUM	7782-49-2	4.4	1000	N	510	nc	510	N
SILVER	7440-22-4	6.5	1000	N	510	nc	510	N
STYRENE	100-42-5	7.20E-03	41000	N	1700	sat	20000	N
1,1,2,2-TETRACHLOROETHANE	79-34-5	0.0072	29	C	0.93	ca	14	C
TETRACHLOROETHENE	127-18-4	0.0072	110	C	1.3	ca	5.3	C
THALLIUM	7440-28-0	3.5	16	N	6.7	nc	7.2	N
TOLUENE	108-88-3	0.012	41000	N	520	sat	8200	N
1,1,1-TRICHLOROETHANE	71-55-6	0.0072	18000	N	1200	sat	200000	N
1,1,2-TRICHLOROETHANE	79-00-5	0.0072	100	C	1.6	ca*	50	C
TRICHLOROETHENE	79-01-6	0.003	520	C	6.5	ca	7.2	C
VANADIUM	7440-62-2	134	1400	N	100	nc	100	N
VINYL CHLORIDE	75-01-4	0.0072	3	C	0.75	ca	4	C
XYLENES	1330-20-7	0.0072	10000	N	420	sat	20000	N
ZINC	7440-66-6	247	61000	N	100000	max	31000	N

NOTES:

Shaded values indicate that the maximum sediment concentration is greater than the specified RBC or PRG.

1. USEPA Region 3 RBC Tables, 1995 (screening values for noncarcinogens are based on a Hazard index of 0.1).
2. USEPA Region 9 PRG Tables, October 2004, updated December 2007 (screening values for noncarcinogens are based on a Hazard index of 0.1).
3. USEPA Region 3 RBC Tables, October 2007 (screening values for noncarcinogens are based on a Hazard index of 0.1).

TABLE G-11

COMPARISON OF SCREENING CONCENTRATIONS BASED ON 1995 REGION 3 RBCS, 2004 REGION 9 PRGS, AND 2007 REGION 3 RBCS FOR TAP WATER SITE 09 - GROUNDWATER

Chemical	CAS #	Maximum GW Conc[1]	1995 RBC for Tap Water[2]		2004 PRG for Tap Water[3]		2007 RBC for Tap Water[4]	
		(ug/L)	(ug/L)		(ug/L)		(ug/L)	
ACETONE	67-64-1	3000	370	N	550	nc	550	N
ALUMINUM	7429-90-5	37700	3700	N	3600	nc	3700	N
ANTIMONY	7440-36-0	71	1.5	N	1.5	nc	1.5	N
ARSENIC	7440-38-2	16.3	0.045	C	0.045	ca	0.045	C
BARIUM	7440-39-3	753	260	N	730	nc	730	N
BENZENE	71-43-2	170	0.36	C	0.35	ca	0.34	C
BERYLLIUM	7440-41-7	2.7	0.016	C	7.3	nc	7.3	N
BIS(2-CHLOROETHYL)ETHER	111-44-4	14	0.0092	C	0.01	ca	0.0096	C
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	3	0.26	C	0.27	ca	0.26	C
CADMIUM-WATER	7440-43-9	5.2	1.8	N	1.8	nc	1.8	N
CHLORDANE	57-74-9	0.01	0.052	C	0.19	ca	0.19	C
CHLOROBENZENE	108-90-7	1200	3.9	N	9	nc	9	N
CHLOROETHANE	75-00-3	9	860	C	4.6	ca	3.6	C
2-CHLOROPHENOL	95-57-8	3	18	N	3	nc	3	N
COBALT	7440-48-4	49.6	220	N	73	nc	NA	
CHROMIUM VI	18540-29-9	9.5	18	N	11	nc	11	N
COPPER	7440-50-8	72	150	N	150	nc	150	N
DDD	72-54-8	3.7	0.28	C	0.28	ca	0.28	C
DIBENZOFURAN	132-64-9	24	15	N	0.61	nc	3.7	N
DIBUTYLPHTHALATE	84-74-2	1	370	N	360	nc	370	N
1,2-DICHLOROBENZENE	95-50-1	8	27	N	37	nc	27	N
1,3-DICHLOROBENZENE	541-73-1	83	54	N	18	nc	1.8	N
1,4-DICHLOROBENZENE	106-46-7	420	0.44	C	0.3	ca	0.28	C
1,2-DICHLOROETHANE	107-06-2	320	0.12	C	0.12	ca*	0.12	C
TOTAL 1,2-DICHLOROETHENE	540-59-0	28000	5.5	N	NA		5.5	N
2,4-DICHLOROPHENOL	120-83-2	4	11	N	11	nc	11	N
1,2-DICHLOROPROPANE	78-87-5	940	0.16	C	0.27	ca	0.26	C
DIELDRIN	60-57-1	2.4	0.0042	C	0.0042	ca	0.0042	C
DIETHYLPHTHALATE	84-66-2	2	2900	N	2900	nc	2900	N
2,4-DIMETHYLPHENOL	105-67-9	16	73	N	73	nc	73	N
ETHYLBENZENE	100-41-4	87	130	N	130	nc	130	N
HEXACHLOROETHANE	67-72-1	3	0.75	C	3.6	nc	4.8	C
IRON	7439-89-6	25500	NA		NA		NA	
MANGANESE	7439-96-5	1910	18	N	88	nc	73	N
MERCURY (AS MERCURIC CHLORIDE)	7487-94-7	0.32	1.1	N	1.1	nc	1.1	N
METHYLENE CHLORIDE	75-09-2	830	4.1	C	4.3	ca	4.1	C

TABLE G-11

COMPARISON OF SCREENING CONCENTRATIONS BASED ON
1995 REGION 3 RBCS, 2004 REGION 9 PRGS, AND 2007 REGION 3 RBCS FOR TAP WATER
SITE 09 - GROUNDWATER

Chemical	CAS #	Maximum GW Conc[1]	1995 RBC for Tap Water[2]		2004 PRG for Tap Water[3]		2007 RBC for Tap Water[4]	
		(ug/L)	(ug/L)		(ug/L)		(ug/L)	
METHYL ETHYL KETONE	78-93-3	4500	190	N	700	nc	700	N
2-METHYLPHENOL	95-48-7	350	180	N	180	nc	180	N
4-METHYLPHENOL	106-44-5	370	18	N	18	nc	18	N
NICKEL	7440-02-0	18.6	73	N	73	nc	73	N
4-NITROANILINE	100-01-6	47	11	N	3.2	ca*	NA	
4-NITROPHENOL	100-02-7	3	230	N	NA		NA	
N-NITROSODIPROPYLAMINE	621-64-7	1	0.0096	C	0.0096	ca	0.0096	C
PENTACHLOROPHENOL	87-86-5	2	0.56	C	0.56	ca	0.56	C
PHENOL	108-95-2	66	2200	N	1100	nc	1100	N
ACENAPHTHENE	83-32-9	66	220	N	37	nc	37	N
CARBAZOLE	86-74-8	11	3.4	C	3.4	ca	3.3	C
FLUORANTHENE	206-44-0	2	150	N	150	nc	150	N
FLUORENE	86-73-7	23	150	N	24	nc	24	N
2-METHYLNAPHTHALENE	91-57-6	25	150	N	NA		2.4	N
NAPHTHALENE	91-20-3	47	150	N	0.62	nc	0.65	N
PYRENE	129-00-0	3	110	N	18	nc	18	N
SILVER	7440-22-4	0.54	18	N	18	nc	18	N
1,1,2,2-TETRACHLOROETHANE	79-34-5	9	0.052	C	0.055	ca	0.053	C
TETRACHLOROETHENE	127-18-4	670	1.1	C	0.1	ca	0.1	C
THALLIUM	7440-28-0	3.9	0.29	N	0.24	nc	0.26	N
TOLUENE	108-88-3	310	75	N	230	nc	230	N
1,2,4-TRICHLOROBENZENE	120-82-1	8	19	N	0.72	nc	6.1	N
1,1,2-TRICHLOROETHANE	79-00-5	84	0.19	C	0.2	ca	0.19	C
TRICHLOROETHENE	79-01-6	1500	1.6	C	1.4	ca	0.026	C
VANADIUM	7440-62-2	23	26	N	3.6	nc	3.7	N
VINYL CHLORIDE	75-01-4	20000	0.019	C	0.02	ca	0.015	C
XYLENES	1330-20-7	190	1200	N	21	nc	21	N
ZINC	7440-66-6	165	1100	N	1100	nc	1100	N

NOTES:

Shaded values indicate that the maximum groundwater concentration is greater than the specified RBC or PRG.

1. Maximum of deep and shallow groundwater samples.
2. USEPA Region 3 RBC Tables, 1995 (screening values for noncarcinogens are based on a Hazard index of 0.1).
3. USEPA Region 9 PRG Tables, October 2004, updated December 2007 (screening values for noncarcinogens are based on a Hazard index of 0.1).
4. USEPA Region 3 RBC Tables, October 2007 (screening values for noncarcinogens are based on a Hazard index of 0.1).

TABLE G-12

COMPARISON OF SCREENING CONCENTRATIONS BASED ON
1995 REGION 3 RBCS, 2004 REGION 9 PRGS, AND 2007 REGION 3 RBCS FOR TAP WATER
SITE 09 - SURFACE WATER

Chemical	CAS #	Maximum SW Conc	1995 RBC for Tap Water[1]		2004 PRG for Tap Water[2]		2007 RBC for Tap Water[3]	
Chemical	CAS	(ug/L)	(ug/L)		(ug/L)		(ug/L)	
ALDRIN	309-00-2	0.0003	0.004	C	0.004	ca	0.0039	C
ALUMINUM	7429-90-5	339	3700	N	3600	nc	3700	N
ARSENIC	7440-38-2	4.2	0.045	C	0.045	ca	0.045	C
CADMIUM-WATER	7440-43-9	10.1	1.8	N	1.8	nc	1.8	N
CARBON DISULFIDE	75-15-0	2	2.1	N	100	nc	100	N
CARBON TETRACHLORIDE	56-23-5	6	0.16	C	0.17	ca*	0.16	C
CHROMIUM VI	18540-29-9	20.1	18	N	11	nc	11	N
COPPER	7440-50-8	5.65	140	N	150	nc	150	N
TOTAL 1,2-DICHLOROETHENE	540-59-0	6	5.5	N	NA		5.5	N
HEXACHLOROBENZENE	118-74-1	0.0004	0.0066	C	0.042	ca	0.042	C
IRON	7439-89-6	7270	NA		NA		NA	
MANGANESE-NONFOOD	7439-96-5	137	18	N	88	nc	73	N
MIREX	2385-85-5	0.0003	0.037	C	0.037	ca	0.73	N
NICKEL	7440-02-0	21.4	73	N	73	nc	73	N
AROCLOR-1242	53469-21-9	0.0092	0.0087	C	0.034	ca	0.033	C
AROCLOR-1254	11097-69-1	0.0079	0.00087	N	0.034	ca*	0.033	C
AROCLOR-1260	11096-82-5	0.0093	0.0087	C	0.034	ca	0.033	C
ACENAPHTHENE	83-32-9	0.034	220	N	37	nc	37	N
ANTHRACENE	120-12-7	0.001	110	N	180	nc	180	N
BENZ[A]ANTHRACENE	56-55-3	0.0026	0.092	C	0.029	ca	0.03	C
BENZO[B]FLUORANTHENE	205-99-2	0.006	0.092	C	0.029	ca	0.03	C
BENZO[K]FLUORANTHENE	207-08-9	0.002	0.92	C	0.29	ca	0.3	C
BENZO[A]PYRENE	50-32-8	0.0032	0.0092	C	0.0029	ca	0.003	C
CHRYSENE	218-01-9	0.004	9.2	C	2.9	ca	3	C
FLUORANTHENE	206-44-0	0.0099	150	N	150	nc	150	N
FLUORENE	86-73-7	0.0024	150	N	24	nc	24	N
NAPHTHALENE	91-20-3	0.0291	150	N	0.62	nc	0.65	N
PYRENE	129-00-0	0.0078	110	N	18	nc	18	N
TRICHLOROETHENE	79-01-6	2	1.6	C	1.4	ca	0.026	C
VANADIUM	7440-62-2	12.1	26	N	3.6	nc	3.7	N
ZINC	7440-66-6	7.01	1100	N	1100	nc	1100	N

NOTES:

Shaded values indicate that the maximum surface water concentration is greater than the specified RBC or PRG.

1. USEPA Region 3 RBC Tables, 1995 (screening values for noncarcinogens are based on a Hazard index of 0.1).

2. USEPA Region 9 PRG Tables, October 2004, updated December 2007 (screening values for noncarcinogens are based on a Hazard index of 0.1).

3. USEPA Region 3 RBC Tables, October 2007 (screening values for noncarcinogens are based on a Hazard index of 0.1).

RECREATIONAL EXPOSURE TO SEDIMENT ALONG THE SHORELINE OF SITE 09

A focused, limited evaluation of the primary contaminants detected in the sediment samples collected as a result of the implementation of the LTMP for Site 09 is presented in Table G-13. The analysis compares maximum detected chemical concentrations for samples collected in 2005 through 2007 to:

- The EPA Region 9 Preliminary Remediation Goals (PRGs) for ***soils*** assuming a ***residential land use scenario***, and

- ***Recreational screening levels*** developed by a simple multiplication of the Region 9 residential soil PRGs by a factor of 10. A factor of 10 was applied to the Region 9 PRGs to account for the fact that the frequency and duration of receptor exposure to the Site 09 shoreline sediments is anticipated to be significantly less than that experienced as a result of the daily exposure to soils assumed under a residential land use scenario. This factor is particularly relevant for the Site 09 sediments because, given the current physical characteristics of the shoreline, recreational activities are likely to be limited along the Site 09 shoreline.

The Region 9 PRGs and recreational screening levels for sediments represent the 1E-06 risk level for carcinogens and a hazard index value (i.e., no adverse non-cancer effects value) of 1 for non-carcinogens. The comparison presented on Table G-13 indicates that although the maximum detected concentrations of several of the carcinogens listed on Table G-13 exceed the Region 9 PRGs and the recreational screening levels, the ***cumulative*** cancer risk estimate (representing the cancer risk associated with exposure to all of the primary contaminants listed on Table G-13) would not exceed 1E-04 or 1E-05 when the maximum concentrations are evaluated against the Region 9 PRGs and recreational screening levels, respectively. The risk estimates presented on Table G-13 were developed using a simple risk-ratio technique that is frequently and routinely used to calculate risk when the anticipated cancer risk estimates are anticipated to be relatively low (i.e., less than 1E-02).

It should be noted that the PRGs and risk-based concentrations presented in Table G-13 consider exposures to the small child receptor (age 0 to 6 years). However, for purposes of calculating PRGs/risk-based concentrations for a carcinogen (e.g., benzo[a]pyrene), one PRG/risk-based concentration value is provided which is based on age-adjusted factors for a receptor (i.e., the value is not specific to a child or adult receptor, rather the value is adjusted to take into account the varying soil ingestion rates and varying body weights for both the child and adult receptor). The small child only is the target receptor for PRGs/risk-based concentrations calculated for non-carcinogens. The reader is referred to the most current versions of the EPA Region 9 PRG guidance and the EPA Region III Risk-Based Concentration guidance for the exposure factors (including the age-adjusted factors), equations, and toxicity criteria used to calculate the PRGs and risk-based concentrations presented in Table G-13.

TABLE G-13

COMPARISON OF CHEMICALS DETECTED IN SEDIMENT SAMPLES TO RISK-BASED CRITERIA
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND
PAGE 1 OF 2

Analytes (PAL µg/kg)	ME 01	ME 02	ME 03	ME 04	ME 05	ME 06	ME 07	ME 08	ME 09	ME 10	ME 11	ME 12	ME 13	ME 14
	Dec 2001/ Jan 2002	Feb-Mar 2002	Jun 2002	Sep 2002	Jan 2003	Apr-May 2003	Jun-Jul 2003	Sep 2003	Dec 2003	Mar 2004	Jun 2004	Aug 2004	Oct 2004	Mar 2005
SED09-01														
4,4'-DDD (20)	17	4.2 U	4.6 U	5 U	4.4 U	4.2 U	4.9 U	4.2 U	4.6 UJ	4.3 U	4.4 U	1.7 UJ	2.2 J	0.99 U
4,4'-DDT (6)	62 J	4.2 U	4.6 U	5 U	4.4 U	4.2 U	4.9 U	4.2 U	4.6 UJ	4.3 U	R	2 UJ	0.92 UJ	0.97 U
Total Aroclor (215)	1600	220	140	910	97	49	350	62	270	110	55.5	152	195	265
SED09-06														
4,4'-DDT (6)	3.9 UJ	4.1 U	4.1 U	4.2 U	4.2 U	4.2 U	4 U	4.2 U/3.9 U	4.1 UJ	4.1 U	3.9 UJ/4.1 UJ	2.1 J	7 J	0.93 U
SED09-07														
4,4'-DDT (6)	4.2 U	4.1 U	4.1 U	4.2 U/4.2 U	4.4 U	4.2 U	4.1 U	9.5	4.3 U	4.1 U	4.1 UJ	1.8 UJ	0.88 UJ	0.87 U
SED09-09														
Dibenzo(a,h)anthracene (260)	7 U	6.4 J	6.2 U	R	14 U	6.2 UJ	6.8 UJ/6.4 UJ	6.3 UJ	6.2 UJ	6.3 UJ	14 U	1.1 UJ	1.2 U	286 J
4,4'-DDE (7.65)	6.9 U	6.7 J	9.5	6.3 U	12 J	6.1 U	6.8 U/6.2 U	6.1 U	6.1 UJ	8.3	4.7 U	1.9 UJ	8.4 J	4.8 J
4,4'-DDT (6)	6.9 U	6.1 U	6.2 U	6.3 U	7 U	6.1 U	6.8 U/6.2 U	6.1 U	6.1 UJ	6.2 U	4.7 UJ	2.7 UJ	1.2 UJ	1.4 U
Total Aroclor (215)	150	120	190	170	450	160	140/170	140	130	170	53.6	28	270	382 4
SED09-10														
Anthracene (1,100)	2.1 U	2.9 J	74 J	3300 J	200 J	89 J	48 J	49 J	230 J	23 J	110 U	52.6 J	1.4 U	62.1 J
Benzo(a)anthracene (1,600)	2.1 U	14 J	190 J	5700 J	520	180 J	99 J	130 J	410 J	62 J	28.8	139	0.57 U	0.63 U
Benzo(a)pyrene (1,600)	2.1 U	12 J	130 J	3300 J	460	150 J	66 J	150 J	300 J	92 J	39.5	146	1.9 U	16.4 J
Chrysene (2,800)	2.1 U	12 J	59 J	6300 J	560	170 J	120 J	140 J	370 J	66 J	20.9 J	134	0.77 U	0.84 U
Dibenzo(a,h)anthracene (260)	4.3 U	4.9 UJ	52 U	R	49 U	24 UJ	10 UJ	5.4 UJ	4.8 UJ	6.3 UJ	16 U	41.5 J	0.96 U	340 J
Fluoranthene (5,100)	4.3 U	27 J	440 J	16000 J	1400	490 J	320 J	380 J	1100 J	140 J	48	507	64.8	622
Fluorene (540)	4.3 U	4.9 UJ	46 J	2500 J	91	55 J	26 J	36 J	200 J	11 J	110 U	0.59 UJ	0.57 U	0.63 U
Phenanthrene (1,500)	2.1 U	14 J	350 J	18570 J	830	360 J	250 J	190 J	1000 J	92 J	31.4 J	418	398	753
Pyrene (2,600)	2.1 U	21 J	350 J	12190 J	1200	410 J	290 J	430 J	920 J	120 J	49.1	343	3.5 U	918 J
Total PAH (44,792)	2.1 U	151.1	1990	77260	6701	2232	1504	1948	7150	902	249.3	2135.8	516	3151.3
Acenaphthene (500)	21 U	25 UJ	260 U	R	250 U	120 UJ	50 UJ	27 UJ	540 J	32 U	110 U	65.7 J	2.2 U	2.8 J
2-Methylnaphthalene (670)	21 U	25 UJ	260 U	R	250 U	120 U	50 UJ	27 UJ	1000 J	32 U	110 U	2 UJ	8.4 J	38.3 J

TABLE G-13

COMPARISON OF CHEMICALS DETECTED IN SEDIMENT SAMPLES TO RISK-BASED CRITERIA
SITE 09 - ALLEN HARBOR LANDFILL
FORMER NCBC DAVISVILLE, NORTH KINGSTOWN, RHODE ISLAND

Analytes (PAL µg/kg)	ME 15	ME 16	ME 17	ME 18	ME 19	ME 20	MAX Concentration	Risk Evaluation Using Maximum 2005-2007 Dectections and EPA Region 9 PRGs/10 X EPA Region 9 PRGs			
	Jun 2005	Sep 2005	Dec 2005	Mar 2006	Nov 2006	Mar 2007	2005 -2007	USEPA Region 9 PRGs Residential	Cancer Risk Estimate Based on PRG	USEPA Region 9 PRGs 10X Residential (Carcinogens only)	Cancer Risk Estimate Based on 10X PRG
SED09-01											
4,4'-DDD (20)	1 U	1.4 UJ	1.3 UJ	21.5 J	0.68 UJ	0.88 U	21.5	2,400	9.0E-09	24000	9.0E-10
4,4'-DDT (6)	1 UJ	1.2 UJ	1.1 UJ	1.2 U	0.57 U	1.1 U	ND	1,700		17000	
Total Aroclor (215)	298	451.8	458	647	582.1	57.3	647	220	2.9E-06	2200	2.9E-07
SED09-06											
4,4'-DDT (6)	0.89 UJ	1 U	0.96 UJ	0.94 U	0.48 U	1 UJ	ND	1,700		17000	
SED09-07											
4,4'-DDT (6)	0.85 UJ	0.97 U	0.99 UJ	1 U	2 J	1 UJ	2	1,700	1.2E-09	17000	1.2E-10
SED09-09											
Dibenzo(a,h)anthracene (260)	1.2 U	21.5 J	5.2 U	25.6 J	16.1 J	4.8 U	286	15	1.9E-05	150	1.9E-06
4,4'-DDE (7.65)	1.3 U	1.6 U	7.4 J	2.9 J	1.2 J	1.6 UJ	8.4	1,700	4.9E-09	17000	4.9E-10
4,4'-DDT (6)	1.3 UJ	1.4 U	68.8 J	1.4 U	0.71 U	1.4 UJ	68.8	1,700	4.0E-08	17000	4.0E-09
Total Aroclor (215)	211.8	115.5	114.3	145	187.1	33.3	382.4	220	1.7E-06	2200	1.7E-07
SED09-10											
Anthracene (1,100)	25.7 J	1.6 U	4.9 U	83.7 J	62.4 J	2.9 U	83.7	22,000,000			
Benzo(a)anthracene (1,600)	135	274	482	183	415	7 J	482	150	3.2E-06	1500	3.2E-07
Benzo(a)pyrene (1,600)	197	2.1 U	820 J	303 J	29.1 J	2.9 U	820	15	5.5E-05	150	5.5E-06
Chrysene (2,800)	89.8 J	0.86 U	391	194	407	3.8 J	407	15,000	2.7E-08	150000	2.7E-09
Dibenzo(a,h)anthracene (260)	11.8 J	1.1 U	120 J	7.8 J	4.4 U	39.6 J	340	15	2.3E-05	150	2.3E-06
Fluoranthene (5,100)	469	750	1320	637	147	34.6 J	1320	2,300,000			
Fluorene (540)	0.58 U	1030	0.81 U	0.61 U	103	9.8 J	1030	2,700,000			
Phenanthrene (1,500)	165	540	37.6 J	467	23.2 U	591	753	2,300,000			
Pyrene (2,600)	289	751	2310	1090	89.8 J	78.3 J	2310	2,300,000			
Total PAH (44,792)	1623.1	3430.7	6811.3	3620.2	1838.9	1552.3	6811.3	NA			
Acenaphthene (500)	2.2 U	2.5 U	5.2 U	91.4 J	135	11.4 J	135	3,700,000			
2-Methylnaphthalene (670)	1.9 U	2.1 U	104 J	21.3 J	83.6 J	10.3 J	104	56,000			
								Total Risk <	**1.0E-04**		**1.0E-05**

Notes:

Black Background = Criteria Exceeded

Gray = Detected

U = Not Detected; J = Quantitation Approximate

Calculation of cancer risk estimates: (Max detected conc * 1E-06)/PRG or recreational screening level.

Risk estimates for residents are based on EPA Region 9 exposure factors and updated toxicity criteria

Risk estimates for recreational are based on 10X the residential Region 9 PRG values.

PAL = Project Action Level (Effects Range Median, September 1999); except for zinc, total PCBs, and 4,4-DDE which are based on site-specific study (SAIC, 1998

BACKUP CALCULATIONS FOR ALLEN HARBOR LANDFILL RISKS

VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF RECREATIONAL USERS TO SOIL
CALCULATION OF ADDITIONAL DERMAL RISKS
SITE 09 - ALLEN HARBOR LANDFILL
NCBC DAVISVILLE

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Point: Entire Site
Receptor Population: Recreational User
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	Intake Equation/ Model Name
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	925	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.5	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	
	EF	Exposure Frequency	days/year	144	
	ED	Exposure Duration	years	16	
	BW	Body Weight	kg	36	
	AT-C	Averaging Time (Cancer)	days	25,550	
	AT-N	Averaging Time (Non-Cancer)	days	5,840	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Dermal Intake - RME = 1.16E-06
Noncancer Dermal Intake - RME = 5.07E-06

Recreational User Soil Dermal Recalcs.xls Table4

CALCULATION OF ADDITION DERMAL CANCER RISKS FOR THE RECREATIONAL USER - SOIL
SITE 09 - ALLEN HARBOR LANDFILL
NCBC DAVISVILLE

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Point: Entire Site
Receptor Population: Recreational User
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Benzo(a)pyrene Equivalent	1.01E+01	mg/kg	1.01E+01	mg/kg	M	1.5E-06	mg/kg-day	7.3E+00	$(mg/kg\text{-}day)^{-1}$	1.1E-05
	Arsenic	3.70E+00	mg/kg	3.70E+00	mg/kg	M	1.3E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.9E-07
											1.E-05
										Additional Dermal Risks	**1.E-05**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.

Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):

PAHs - 0.13 Arsenic - 0.03

Total Recreational Soil Risk from 1996 RI	**4.E-05**
Additional Dermal Risks	**1.E-05**
Total Risk	**5.E-05**

VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF RECREATIONAL USERS TO SEDIMENT
CALCULATION OF ADDITIONAL DERMAL RISKS
SITE 09 - ALLEN HARBOR LANDFILL
NCBC DAVISVILLE

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Point: Entire Site
Receptor Population: Recreational User
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	Intake Equation/ Model Name
Dermal	Csed	Chemical Concentration in Sediment	mg/kg	95% UCL or Max	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	463	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.5	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	
	EF	Exposure Frequency	days/year	144	
	ED	Exposure Duration	years	16	
	BW	Body Weight	kg	36	
	AT-C	Averaging Time (Cancer)	days	25,550	
	AT-N	Averaging Time (Non-Cancer)	days	5,840	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Dermal Intake - RME = 5.80E-07
Noncancer Dermal Intake - RME = 2.54E-06

CALCULATION OF ADDITION DERMAL CANCER RISKS FOR THE RECREATIONAL USER - SEDIMENT
SITE 09 - ALLEN HARBOR LANDFILL
NCBC DAVISVILLE

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Point: Entire Site
Receptor Population: Recreational User
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Benzo(a)pyrene Equivalent	6.96E+00	mg/kg	6.96E+00	mg/kg	M	5.2E-07	mg/kg-day	7.3E+00	$(mg/kg\text{-}day)^{-1}$	3.8E-06
	Arsenic	3.25E+01	mg/kg	3.25E+01	mg/kg	M	5.7E-07	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	8.5E-07
											5.E-06
										Additional Dermal Risks	**5.E-06**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):
PAHs - 0.13 *Arsenic - 0.03*

Total Recreational Sediment Risk from 1996 RI	**1.E-05**
Additional Dermal Risks	**5.E-06**
Total Risk	**1.5E-05**

Recreational User Sediment Dermal Recalcs.xlsTbl8Recr

VALUES OF DAILY INTAKE CALCULATIONS FOR EXPOSURE OF CONSTRUCTION WORKERS TO SOIL
CALCULATION OF ADDITIONAL DERMAL RISKS
SITE 09 - ALLEN HARBOR LANDFILL
NCBC DAVISVILLE

Scenario Timeframe: Future
Medium: Soil
Exposure Point: Entire Site
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	Intake Equation/ Model Name
Dermal	Csoil	Chemical Concentration in Soil	mg/kg	95% UCL or Max	Dermal CDI[1] (mg/kg/day) =
	CF	Conversion Factor	kg/mg	1.0E-06	Csoil x CF x SA x AF x ABS x EF x ED
	SA	Skin Surface Area	cm^2/day	3,300	BW x AT
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.3	U.S. EPA, December 1989
	ABS	Dermal Absorption Factor (Solid)	unitless	chemical specific	
	EF	Exposure Frequency	days/year	150	
	ED	Exposure Duration	years	1	
	BW	Body Weight	kg	70	
	AT-C	Averaging Time (Cancer)	days	25,550	
	AT-N	Averaging Time (Non-Cancer)	days	365	

1 CDI = Chronic Daily Intake

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Dermal Intake - RME = 8.30E-08
Noncancer Dermal Intake - RME = 5.81E-06

Construction1.xls Table4

CALCULATION OF ADDITION DERMAL CANCER RISKS FOR THE CONSTRUCTION WORKER
SITE 9 - ALLEN HARBOR LANDFILL
NCBC DAVISVILLE

Scenario Timeframe: Future
Medium: Soil
Exposure Point: Entire Site
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Dermal	Benzo(a)pyrene Equivalent	1.01E+01	mg/kg	1.01E+01	mg/kg	M	1.1E-07	mg/kg-day	7.3E+00	$(mg/kg\text{-}day)^{-1}$	7.9E-07
	Arsenic	3.70E+00	mg/kg	3.70E+00	mg/kg	M	9.2E-09	mg/kg-day	1.5E+00	$(mg/kg\text{-}day)^{-1}$	1.4E-08
	(total)										**8.1E-07**
										Additional Dermal Risks	**8.1E-07**

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
Dermal Absorption Fraction from Soil(ABS) (USEPA, July 2004):
PAHs - 0.13 Arsenic - 0.03

Total Soil Risk from 1996 RI	**2.E-06**
Additional Dermal Risks	**8.E-07**
Total Risk	**3.E-06**